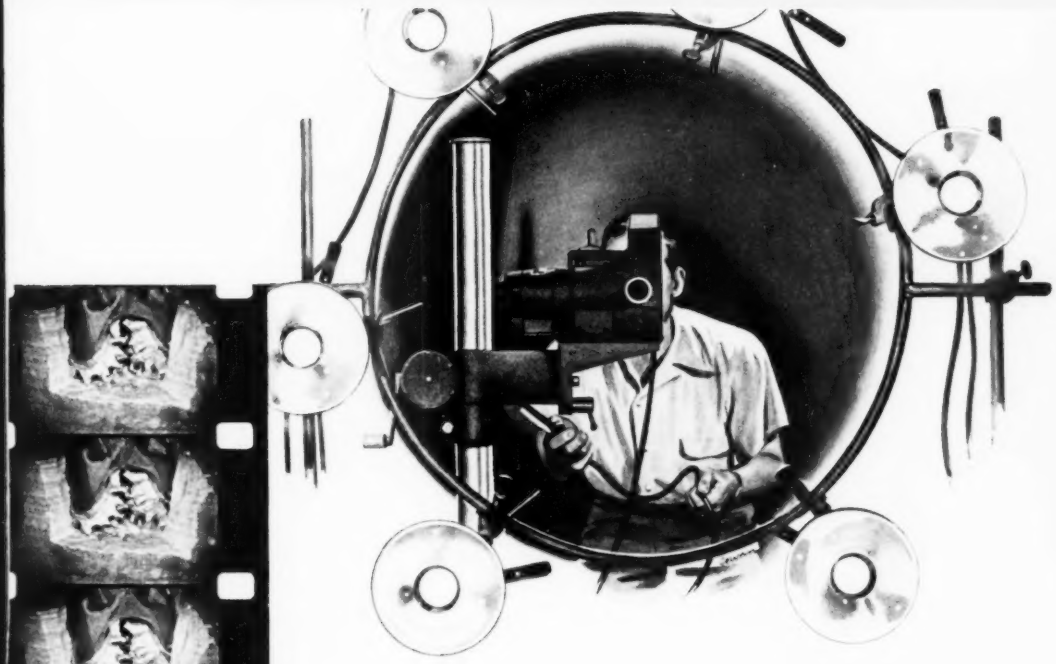
the OIL AND GAS JOURNAL



BIT ACTION IN *SLOW MOTION*

Motion pictures, taken at 3000 frames per second—*100 feet in two seconds*—are being used to study bit performance at the Hughes research laboratory.

Focused on a bit drilling in a test block, the high speed camera records, in slowest of slow motion, how the teeth bite into the formation; shows effect of tooth structure, tooth spacing and other design features on drilling efficiency.

Details, impossible to see with the naked eye, become crystal clear when the high speed film is projected on the screen.

This is only one of the many modern tools used by Hughes research engineers in studying rock bit performance. Supplemented by data obtained from millions of bits run on thousands of rigs, this research enables Hughes to design and build the industry's best rock bits.

HUGHES
TOOL COMPANY
HOUSTON, TEXAS
WORLD STANDARD
OF THE INDUSTRY

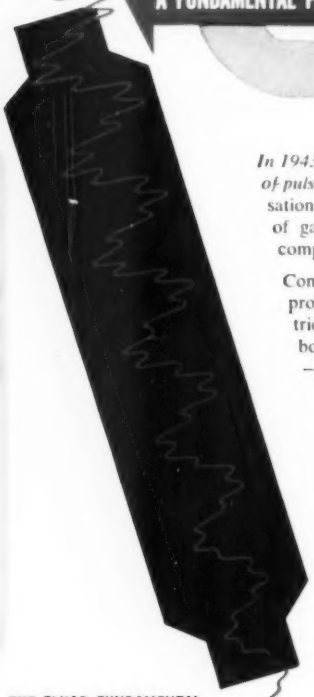
PRICE 50 CENTS TABLE OF CONTENTS PAGE 91 **AUGUST 23, 1951**

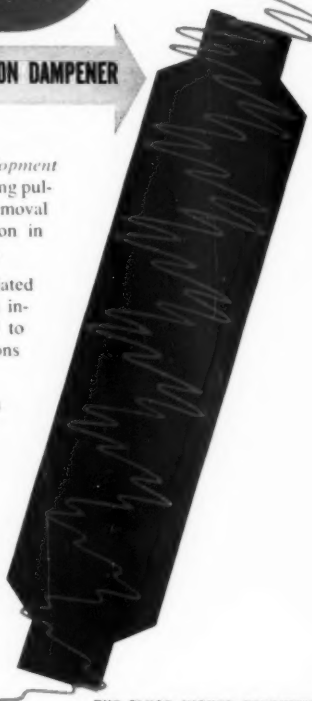
only FLUOR offers this selection

A CHOICE OF TWO PULSATION DAMPENERS TO SOLVE YOUR PARTICULAR PROBLEM!

A FUNDAMENTAL PULSATION DAMPENER

A HIGHER FREQUENCY PULSATION DAMPENER





In 1943, The Fluor Corporation pioneered the development of pulsation dampeners. The first U. S. Patent covering pulsation dampeners designed specifically for the removal of gas stream pulsation and subsequent vibration in compressor piping was issued to Fluor in 1946.

Continued research in gas pulsation and its associated problems has established that pulsation, and its intricate secondary vibration, can be attributed to both fundamental and high frequency pulsations *—or to high frequency components alone.*

Whichever of these destructive conditions exists in your plant, Fluor offers a dampener engineered to fit the requirements of the specific problem. Fluor—and only Fluor—offers such a complete range of pulsation dampeners. For this reason you can be assured of an unbiased recommendation on the best type dampener for your *particular* requirements.

THE FLUOR FUNDAMENTAL PULSATION DAMPENER

This type dampener smooths out all pulsations in the gas stream to the extent of at least 85%. All harmonics originally set up in each pulse cycle are automatically reduced or elimimated. This dampener is the guaranteed answer in plants where structural vibration and metering difficulties are encountered—irrespective of pulsation frequency.

MAKE YOUR OWN PRELIMINARY SURVEY

In many cases you can make your own preliminary survey to determine roughly if your pipe vibration is caused by pulsations. Write The Fluor Corporation, Ltd., Los Angeles 22, California, indicating layout of compressor house piping and operating pressures. A procedure will be mailed to you promptly. No obligation.

THE FLUOR HIGHER FREQUENCY PULSATION DAMPENER

This dampener removes objectionable pulsation frequencies encountered above the fundamental. In many instances, it has been found that metering difficulties and vibration of compressor piping and nearby vessels have been caused by the higher frequency components alone. Available in both manifold and in-line types, this dampener is competitive in cost with muffler or snubber type devices.

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Take advantage of Du Pont Technical Services TO REDUCE ANTIOXIDANT TREATING COSTS!

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THE DU PONT LABORATORIES, for example, have had many years of valuable experience in working with refiners on their antioxidant treating problems. They will be glad to evaluate your gasoline to determine the most effective antioxidant for your particular stock. In many cases, their recommendations have resulted in substantially lowered treating costs.

IN ADDITION, Du Pont technical representatives are available to you for at-the-plant assistance. Because of their special training and wide experience, these men are prepared to help you solve any additives problem economically.

MANY YEARS OF MANUFACTURING EXPERIENCE have gone into the development of Du Pont Antioxidants. Since the early 20's, the extensive research facilities of Du Pont have been working closely with the Petroleum Industry on antioxidant improvements. As a result, you can always depend on Du Pont Antioxidants for uniform quality and low-cost efficiency.

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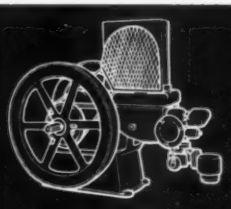
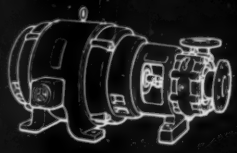
it's FAIRBANKS-MORSE

Electric Motors



ZC Engines



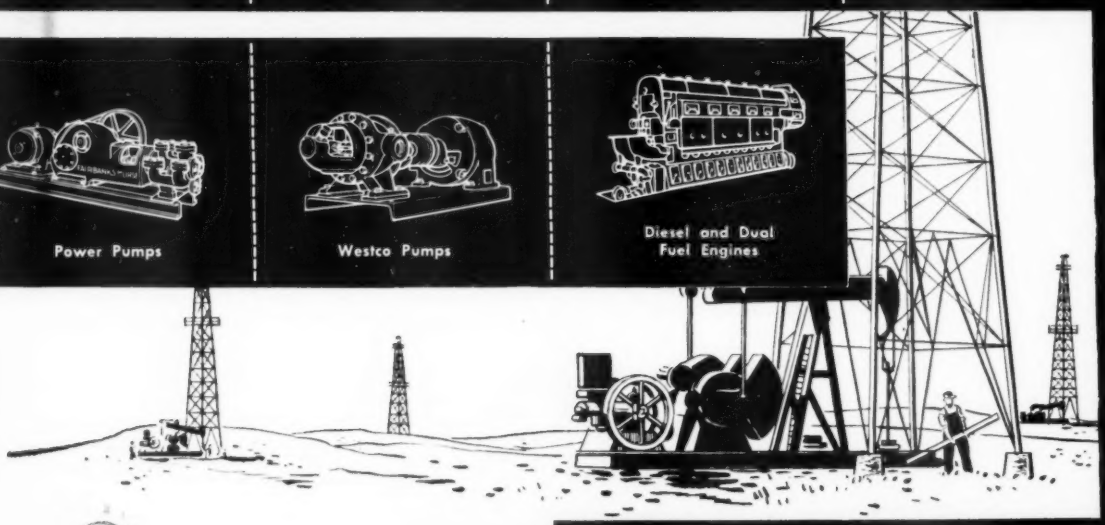
Builtogether Pumps

Rotary Pumps

Power Pumps

Westco Pumps

Diesel and Dual Fuel Engines



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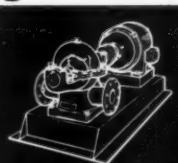
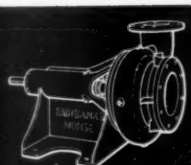
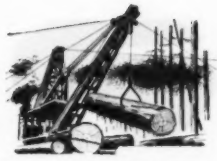


Single and Two-Stage Centrifugal Pumps



Side-Suction Centrifugal Pumps

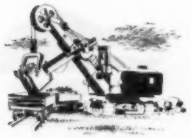


For Logging

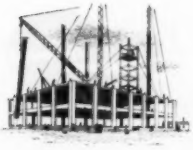
For Sand and Gravel

For Aircraft

For Marine

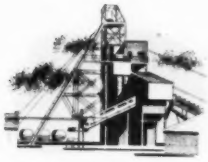


For Stone Quarries



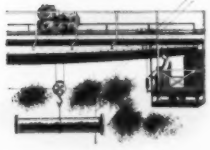
For Construction

For Elevators



For Mining

For Drilling



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BULLETIN 5025 gives information on "How to order Wire Rope" and lists all sizes and constructions of Improved Plow Steel Monarch Whyte Strand Wire Rope. Copy sent on request.

1009

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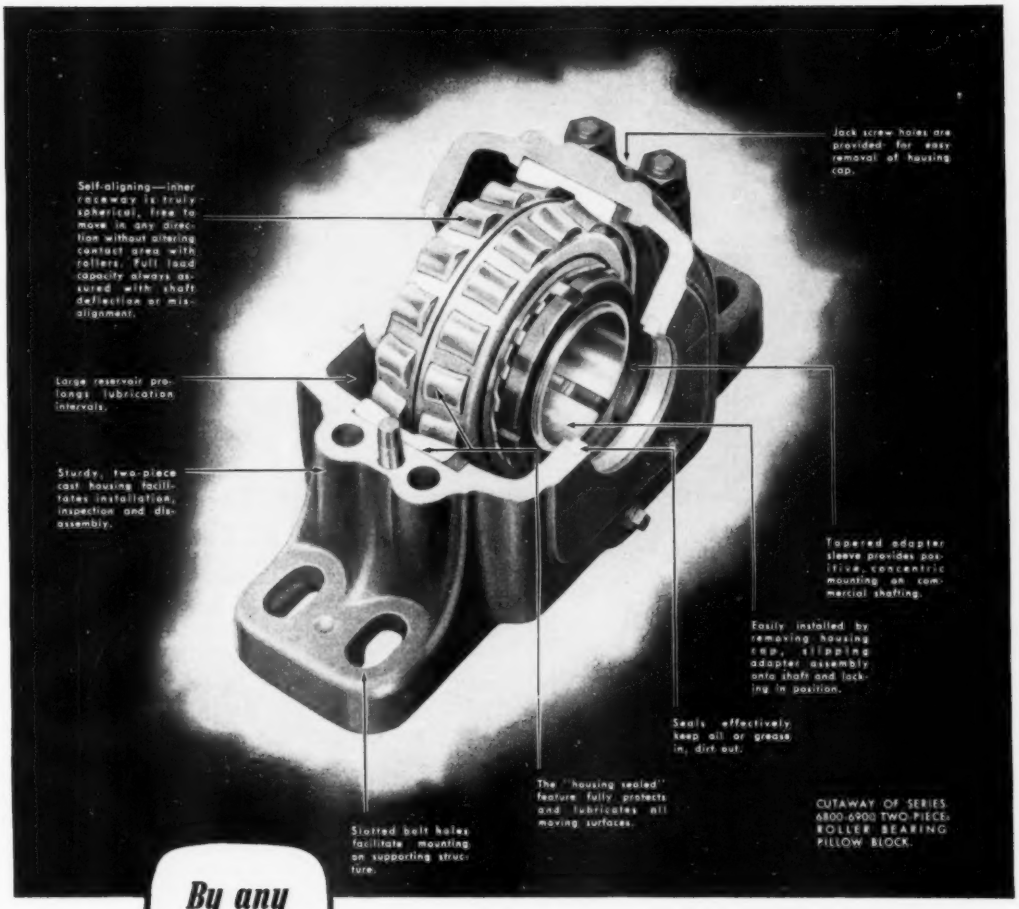
LINK-BELT Ball and Roller Bearings smooth the path of power


Jack screw holes are provided for easy removal of housing cap.
Self-aligning—inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured with shaft deflection or misalignment.
Large reservoir prolongs lubrication intervals.
Sturdy, two-piece cast housing facilitates installation, inspection and disassembly.
Tapered adapter sleeve provides positive, concentric mounting on commercial shafting.
Easily installed by removing housing cap, slipping adapter assembly onto shaft and locking in position.
Seals effectively keep oil or grease in, dirt out.
The "housing sealed" feature fully protects and lubricates all moving surfaces.
Slotted bolt holes facilitate mounting on supporting structure.
CUTAWAY OF SERIES 6800-6900 TWO-PIECE ROLLER BEARING PILLOW BLOCK.

By any standard . . . **LINK-BELT ball and roller two-piece housing facilitates mounting assembly**

Mounting Link-Belt two-piece housing pillow blocks to your assembly is a quick, easy job. The dowel pin holes are tapped so that a standard threaded bolt can serve as a jack screw to raise the cap for installation. Then just slip the adapter assembly onto the shaft and lock securely into position. There are many other Link-Belt design advantages. Our bearing specialist near you will show you how to apply them efficiently to your application. And you'll find complete engineering information in Data Book 2550.

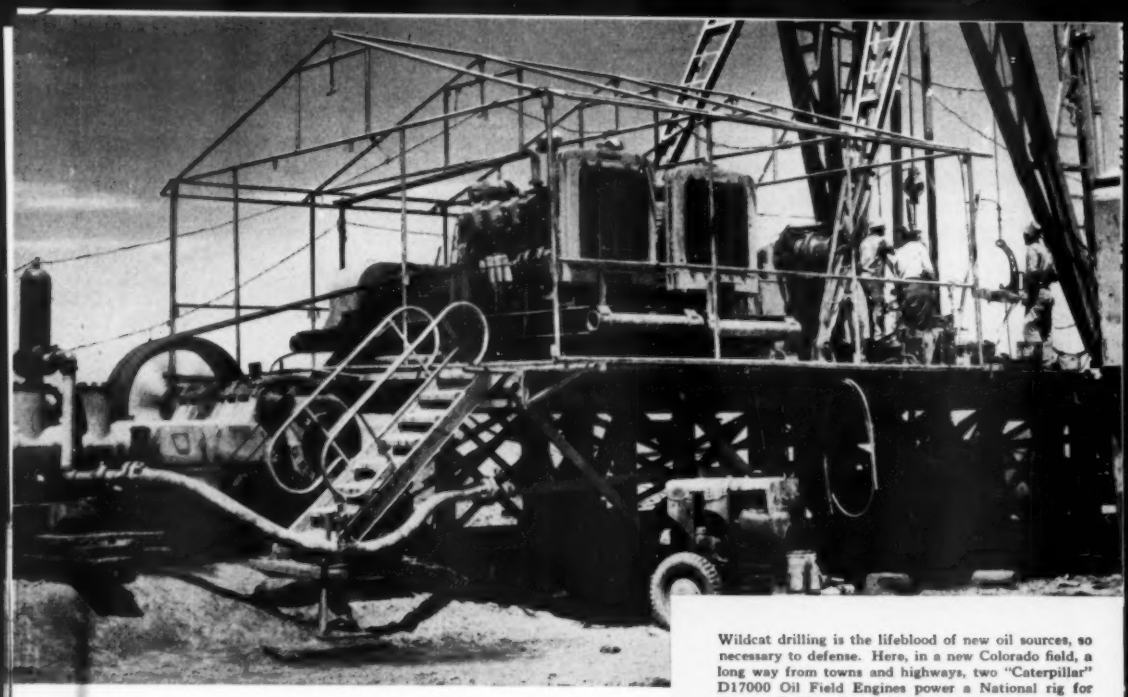
LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY

Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, Kansas City 8, Mo., New York 7, Toronto 8.
Distributors in all fields. 12.264

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910 at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1951.



Wildcat drilling is the lifeblood of new oil sources, so necessary to defense. Here, in a new Colorado field, a long way from towns and highways, two "Caterpillar" D17000 Oil Field Engines power a National rig for Reserve Drilling Co., of Glenrock, Wyoming.

There's a big job ahead

How your equipment takes the beating of the months ahead is important to the whole defense effort of the free world. Our 6-million barrel daily production of crude must be maintained or increased this year as a vital factor in defense. And we're entering a period when drilling machinery must stand up or else.

Look at the engine field. Military and Defense Rated Orders are taking their share of "Caterpillar" production. Shortages of steel and other materials make it still more difficult to supply new machines. This means that *much present equipment must be kept in use.*

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YET CAN BE DRILLED OUT IN 4 to 6 HOURS

That's Easy!

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Drillable

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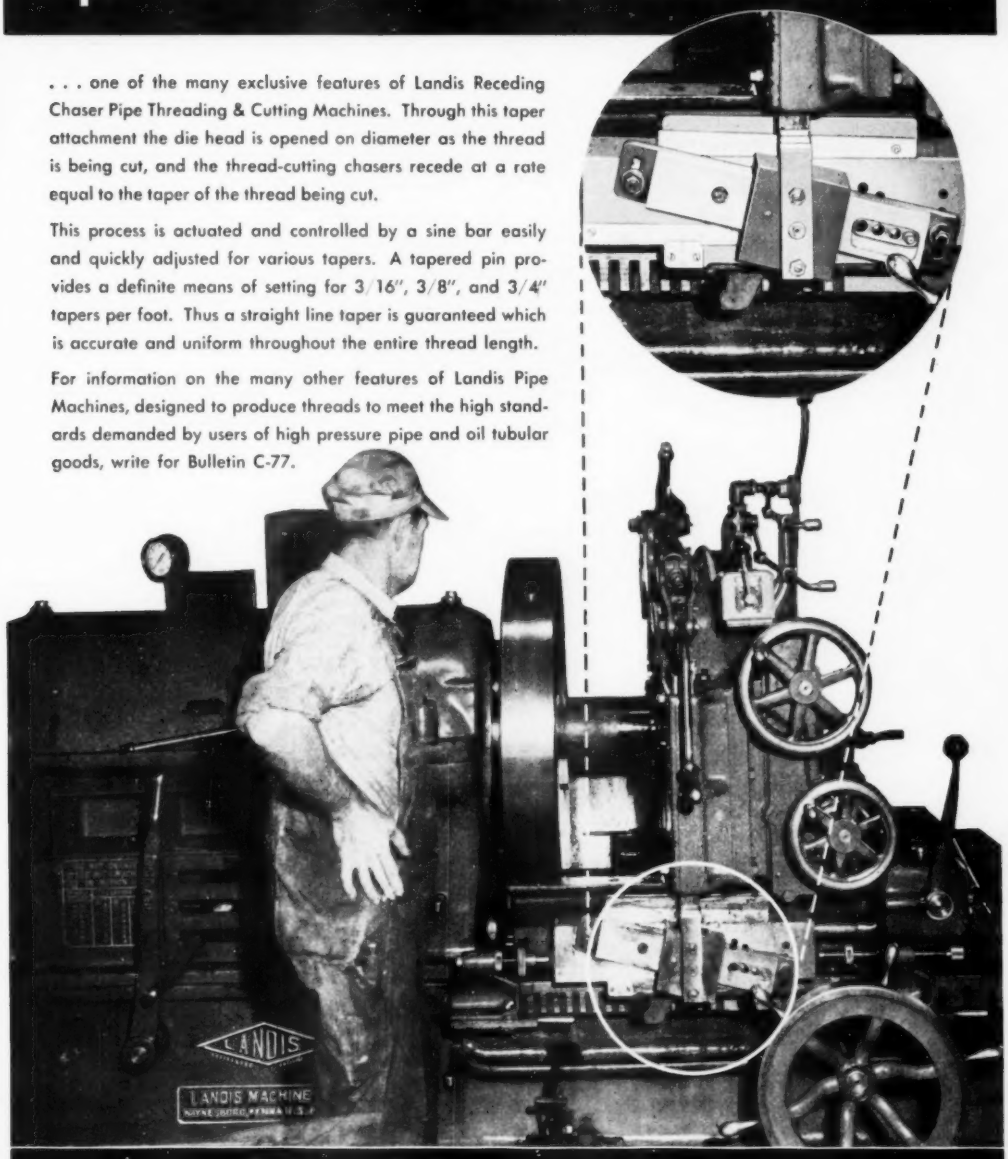

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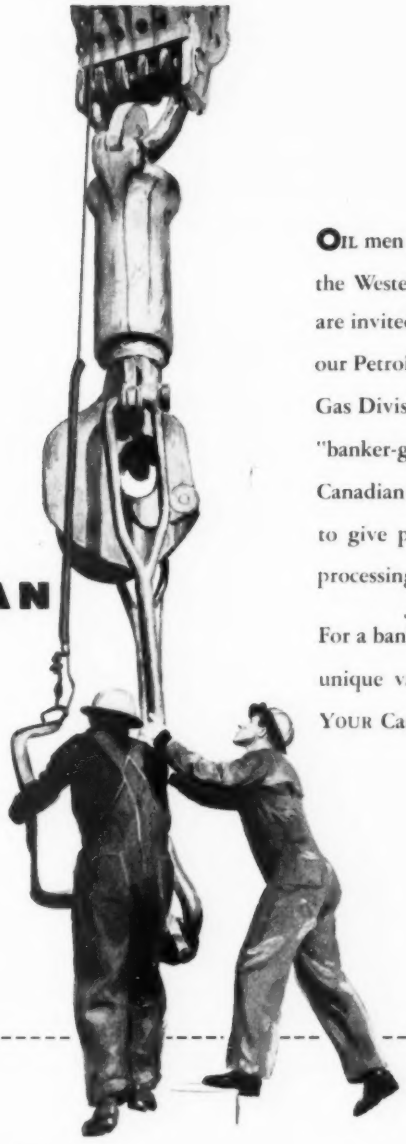

OIL men interested in the Western Canadian oil fields are invited to consult with our Petroleum and Natural Gas Division at Calgary. Its "banker-geologist" team knows Canadian oil . . . and knows how to give practical help in processing oil financing plans.

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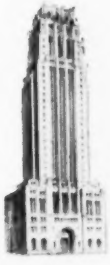

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Up to 1000 feet

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H.P. RANGE
Up to 2,500 h.p.

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Choice of oil or water lubrication.

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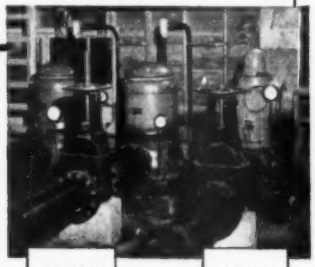

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This successful, close-coupled, modification of the Peerless vertical deep well turbine pump, for industrial processes, embodies all the outstanding design and performance characteristics which have made Peerless the leader in the sale of vertical, deep well turbine pumps. Peerless vertical close-coupled turbine pumps are economically applied to a widest range of municipal, industrial and commercial water lifting or boosting and circulation processes, where short or medium pump settings are involved. Plan with Peerless to get the power, capacity and utility of this vertical space-saving pump that will cut your pump overhead with measurable savings. Descriptive Bulletin No. B-159 describes and illustrates its design, performance and applications, write for it today.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION

Address Inquiries to Factories at:
Los Angeles 31, California or Indianapolis 8, Indiana.
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix; Dallas, Plainview, Lubbock, Texas; Albuquerque, New Mexico.

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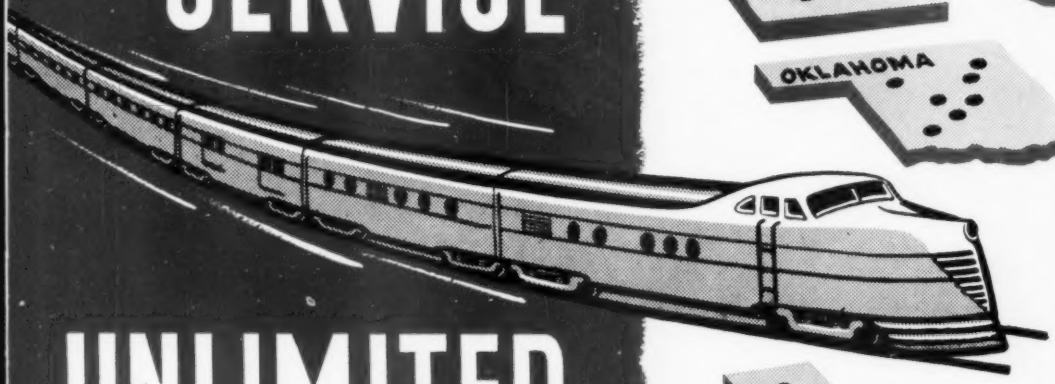

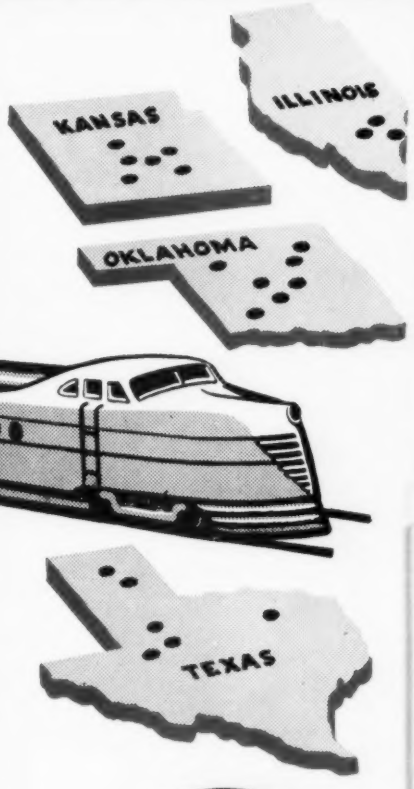

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Whatever you need—from tiny fittings to giant draw works—you'll find available for you at BOVAIRD'S. And you'll find every BOVAIRD store staffed with experienced, capable personnel to help you select the right supplies for your particular needs.

Put BOVAIRD'S 79 years of oil field supply experience to work for you. No order is too small or too large for BOVAIRD to fill quickly and efficiently.

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PRECISION *Threading*

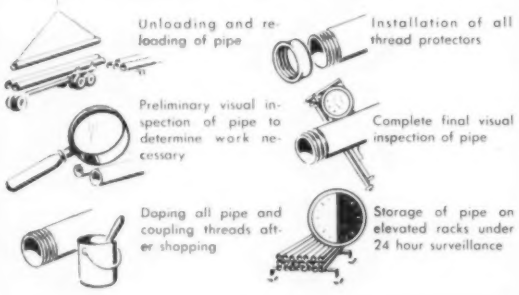
PRECISION — that's the only word that describes modern oil field requirements! Precision geology, precision drilling, precision operations — no matter what oil activity you consider, precision is the word.

Here at Standard, precision is the watchword, precision threading, precision bevelling, precision coupling — ***it must be right!***

We take pride in our seven pipe machines, realizing that only the finest, most modern equipment, properly maintained and operated by experienced, capable personnel can produce the superior work we are noted for.

Our machines can handle the range of pipe from ⅛" to 18" diameters, offering the only complete shopping service in the entire Gulf Coast area. Our Landis Machines, with receding head, taper attachment and lead screw devices, automatically cut each thread to API specifications for length, depth and taper. A complete set of API gauges enables our operators to double-check their work.

THESE STANDARD "EXTRAS" COST NO MORE!



Unloading and reloading of pipe

Installation of all thread protectors

Preliminary visual inspection of pipe to determine work necessary

Complete final visual inspection of pipe

Doping all pipe and coupling threads after shopping

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Superior service at competitive prices — for your next precision threading or bevelling job — Check with Standard first!

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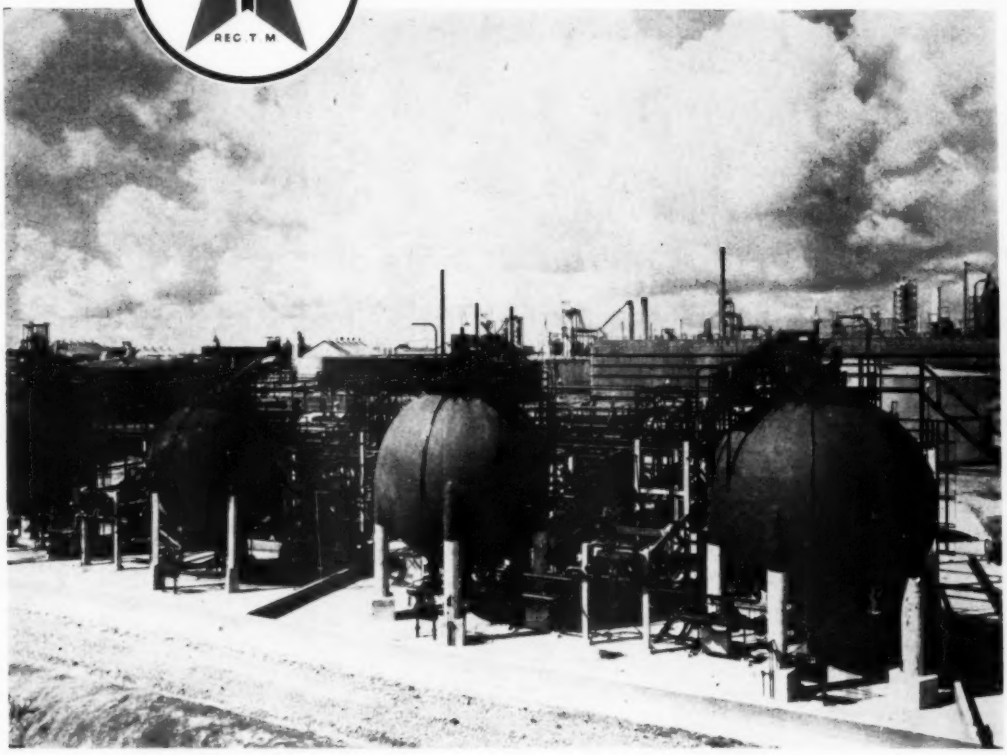
another leading refiner who desalts with PETRECO



Illustrated above is one of the largest batteries of Petreco Electrospheres in the world. This installation is located at the Port Arthur, Texas, refinery of The Texas Company. In refinery after refinery, Petreco Desalters have proved their pay-out by increasing on stream time, increasing expected unit throughputs and by reducing maintenance and repair costs. These advantages derived from charging desalted crudes also entail benefits such as reduced furnace plugging, longer tube life, maximum exchanger efficiency, less corrosion in the topping section, clear water bleed, salvaged waste oil and trouble-free, automatic desalter operation. For the best in desalting performance and service, get Petreco.

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PETRECO

SPECIALIZED *Electric* **PETROLEUM PROCESSES** { DESALTING / DEHYDRATING

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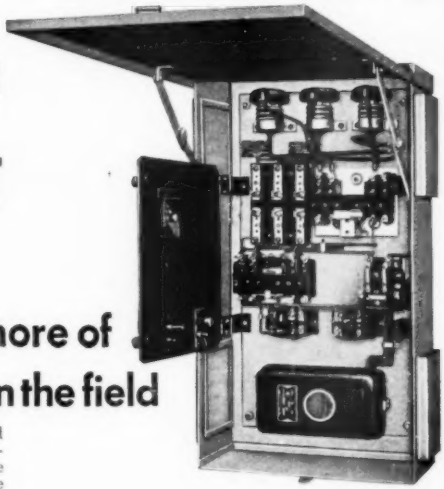
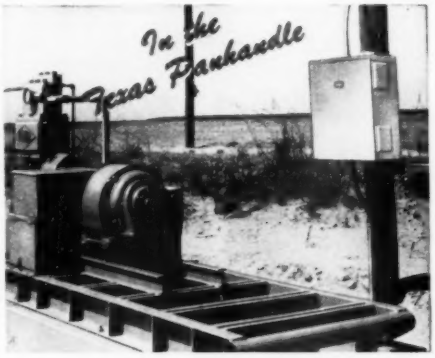


Cutler-Hammer Oil Well Pumping Control has more of what you want than anything in the field

The Cutler-Hammer Oil Well Pumping Control is shaped by the special requirements of the oil country into the oilfield's outstanding well pumping control. It beats the heat. It beats the dust. It stands up in the toughest tests.

Aluminum painted enclosures beat back the sun's heat. Proper ventilation drains off the heat from inside. You don't have to prop the door open to dirt, insects and birds to keep this controller cool and working. Fine mesh screened, louvered and guarded ventilation, vertical dust-safe, dust-shedding contacts, neoprene gasketed dustproof timer enclosure, timer clock motor with excess torque—all these features keep the controller working in dustiest climates.

Unit type lightning arresters reveal condition at a glance. You don't have to rebuild controller if one blows. The Cutler-Hammer Controller with automatic timed restarting feature means the attendant doesn't have to reset the control after a power failure. He knows the C-H Controller will restart the motors on a safe staggered time sequence. When on-off pumping schedule is changed, the change is made simply by pulling accessible tabs, one pull for each 15-minute change—and no guessing. To reset a clock to correct time of day, attendant simply turns a handy palm size dial forward or backward. The wiring diagram with spare parts list and overload heater coil ratings is sealed in a dirt, grease, water and heat resisting plastic coat. You and your men will like these oil country starters better than any you've ever seen. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



If you're all "gummed up"

in a tough heat transfer problem

Specify..

Vogt Spiral, Spring Type Scraper
Patent No. 2,117,475

Vogt

SCRAPER TYPE

CHILLERS

Photos show shop assembly without driving motor.

Fouling of the inner pipe surfaces of Vogt Chillers is eliminated, because they are swept clean continuously during operation by patented spiral, spring type scrapers. And these clean surfaces achieve the highest possible rate of heat transfer between the solution and the refrigerant.

VOGT DOUBLE PIPE TYPE CHILLERS are designed to use ammonia, brine, or cold dewaxed oil as the cooling medium. Oil or brine, when employed, is circulated through the jacket pipes countercurrent to the flow of the solution in the inner pipes.

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Our engineering staff is qualified by training and experience to help you find the right answers to your heat transfer problems. Their recommendations are available without obligation.

Vogt FOR BETTER CHILLERS

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WIRE ROPE

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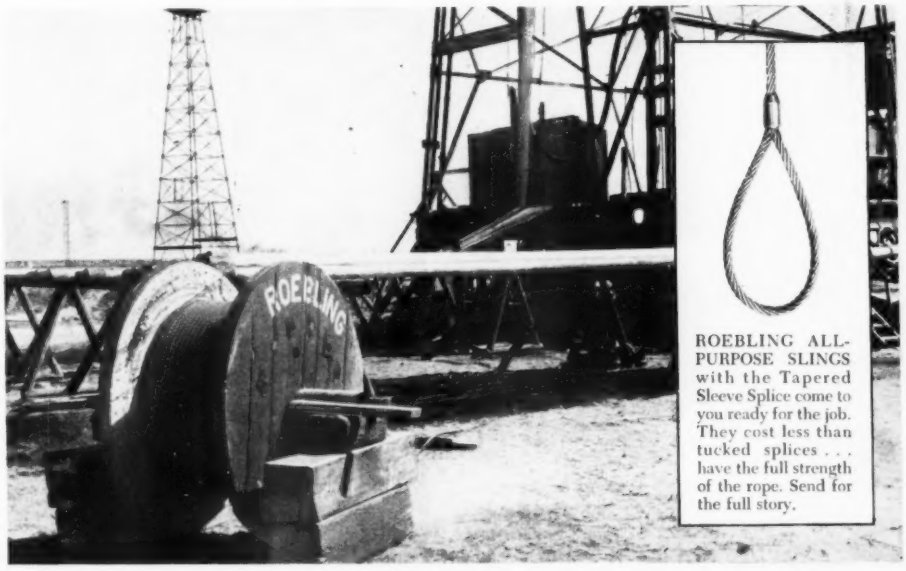
Roebling makes a full line of wire rope. Have your Roebling Field Man recommend the *right* ropes for your requirements. And for longest life on the job, get his advice on the correct use and maintenance of wire rope. It is based on experience with thousands of installations. John A. Roebling's Sons Company, Trenton 2, New Jersey.



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10 REASONS *WHY...*

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assures you the finest in WELDING FITTINGS

Only Globe's precision process of manufacturing seamless welding fittings *begins with the billet*! For Globe alone among welding fitting manufacturers produces seamless tubing . . . and Globe alone has the facilities to provide exact technical control at every stage of manufacture — from billet — to tube — to fitting — *in its own plant.* That's one reason why users who want dependable fittings specify Globe!

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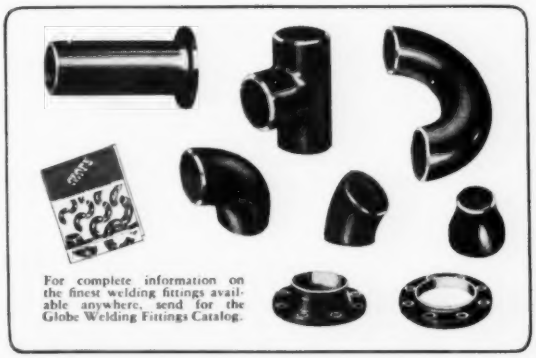
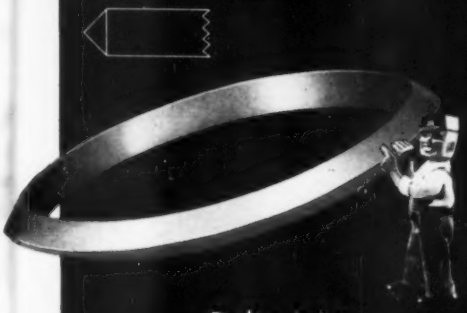
Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globeiron (high-purity ingot iron) seamless tubes — Globe Welding Fittings.



For complete information on the finest welding fittings available anywhere, send for the Globe Welding Fittings Catalog.

Need special high pressure gaskets such as these?

Flare-type Gasket with Bellows Action



Delta Joint Gasket

Pressure Seal Joint Gasket

We tailor them to your specifications

If you require high pressure gaskets made to extremely close tolerances—for service exceeding 10,000 psi, for example—and fabricated to any desired diameter or cross-section, why not look into the special service that Goetze offers for making these gaskets to your order.

The gaskets shown above are typical of the wide variety for high pressure service that have been made to order for Goetze customers. The flare type gasket with bellows action illustrated at upper right is but one example of what Goetze "know-how" can accomplish.

Goetze has had over sixty years of experience in making specialized metallic gaskets for industry's most complex jobs. Modern machines—many of them specially designed and built by Goetze—enable Goetze craftsmen to produce gaskets of any required design, shape or size... and deliver them with remarkable promptness.

For further information about Johns-Manville Goetze gaskets, write for a copy of the new Goetze Gasket Catalog. Or send us a drawing or template for assistance on your specific problem. Address Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville *Goetze* GASKETS

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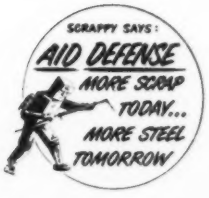
Unless dwindling scrap piles are replenished immediately, steel production will suffer. *Extra* scrap is needed—above and beyond the "working" scrap which steel users regularly sell.

Comb YOUR Operation!

How much valuable scrap do *you* have just lying around? Old machines and equipment . . . useless parts . . . odds and ends. This is the kind of scrap that's urgently needed now. It will get more steel for everybody.

Here's a Quick Way-

Put *one* man in charge of getting all the scrap in your operation collected and turned over to your scrap dealer. Set the date for the job to be done.



Do it NOW!

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

Choose 3 Powered Axles to carry heavy loads best— Choose an FWD 6x6

"That big FWD is sure a 'bear' for work — on or off the road. Power to spare — handles like a kitten under any load."

"I'm convinced an FWD 6x6 is tailor-made for our kind of job — heavy hauling, bulky awkward loads — tough cross-country traveling."

That's typical oil-man talk about FWD's. The reasons for it are simple. There's added traction and safety with 6x6 drive and balanced distribution of weight and power — specifically engineered for smooth and rough going on hard surface or soft bottom. They all add up to one thing — continuous outstanding performance over longer truck life. Get the complete FWD 6x6 story — 30,000 lbs. to 60,000 lbs. GVW — an oil-man's truck for oil-man's work.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory — Kitchener, Ontario

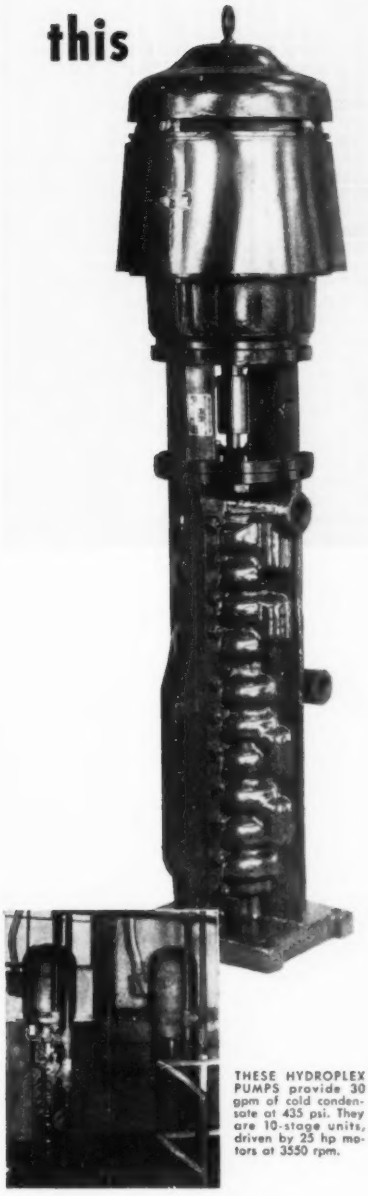
World-Wide Sales and Service

America's Foremost Heavy-Duty Truck

this small, low-priced

BJ HYDROPLEX PUMP

is *engineered* for economical boiler feed service



THESE HYDROPLEX PUMPS provide 30 gpm of cold condensate at 435 psi. They are 10-stage units, driven by 25 hp motors at 3550 rpm.

- For medium pressure, medium temperature, low capacity pumping.
- Uniform, non-pulsating flow.
- Variable capacities without by-pass or speed change.
- Vertical construction—needs only a simple foundation and a minimum of floor space.
- No relief valves.
- Only one stuffingbox . . . and it is under suction pressure.
- Radial forces balanced at all loads by staggered volute construction.
- Axial thrust balanced by opposed grouping of impellers.
- Easily dismantled and reassembled.

IF YOUR PUMPING JOB involves a medium pressure, medium temperature, low capacity operation, the BJ Hydroplex can do it with quiet, smooth efficiency *and with less installation and maintenance cost*. This smaller, low-priced version of the highly successful BJ Hydropress centrifugal pump has a capacity range from 10 to 140 gpm at heads of 450 to 1700 feet. It operates at high speeds—3550 rpm on 60 cycle and 2950 on 50 cycle and higher in special units.

You'll find that this simple, dependable BJ Hydroplex has definite advantages over complex displacement type pumps. For full information, send the coupon now.

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Our problem is pumping _____ gpm of _____
at a head of _____ Tell me more about the BJ Hydroplex.

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CITY _____ STATE _____

No obligation, of course.

PUT THIS *New Low Cost* IMO ON YOUR OIL LINES!

I-161R

Now you can have all the advantages of the IMO: high speed operation – quietness – freedom from vibration – simplicity – reliability – at less cost than ever before.

Look at the cross-section and you will see why no other pump is quite so well suited for oil handling service.

The axial flow design permits oil to be pumped close to the rotating axis of the rotors. This means low liquid velocity and quiet operation at high speeds.

Large inlet areas provide smooth entrance of liquid into the pump and permit the handling of high viscosities at high suction lifts.

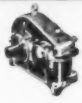
The A313A IMO has no stuffing boxes to leak or require packing, and best of all, it can be mounted in any position and be directly connected for operation at motor speeds.

For your next oil handling job, be sure of the best . . . specify the new low cost A313A IMO pump. Bulletin on request.

IMO-DE LAVAL PRODUCTS DIVISION

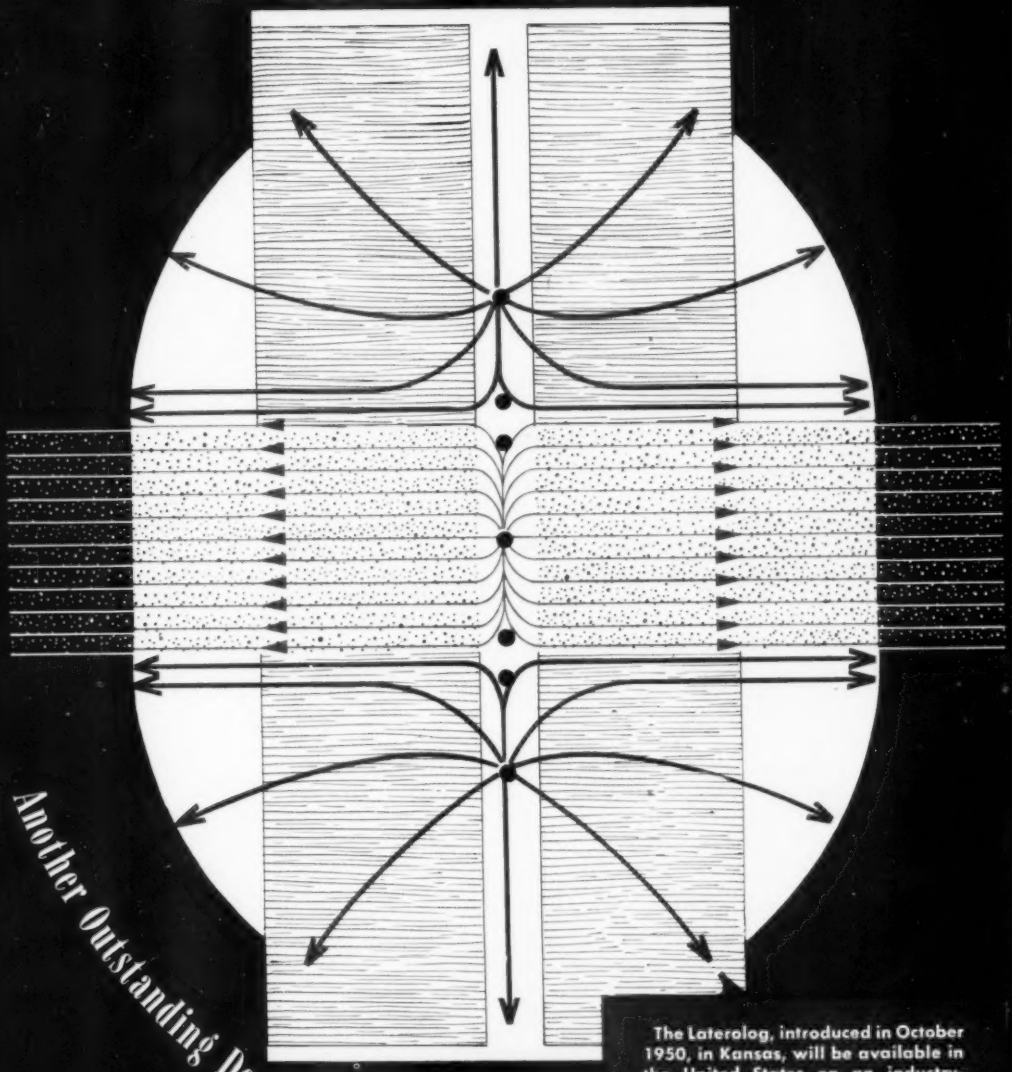
DeLaval Steam Turbine Company, Trenton 2, New Jersey

DE LAVAL



ANNOUNCING

The LATEROLOG



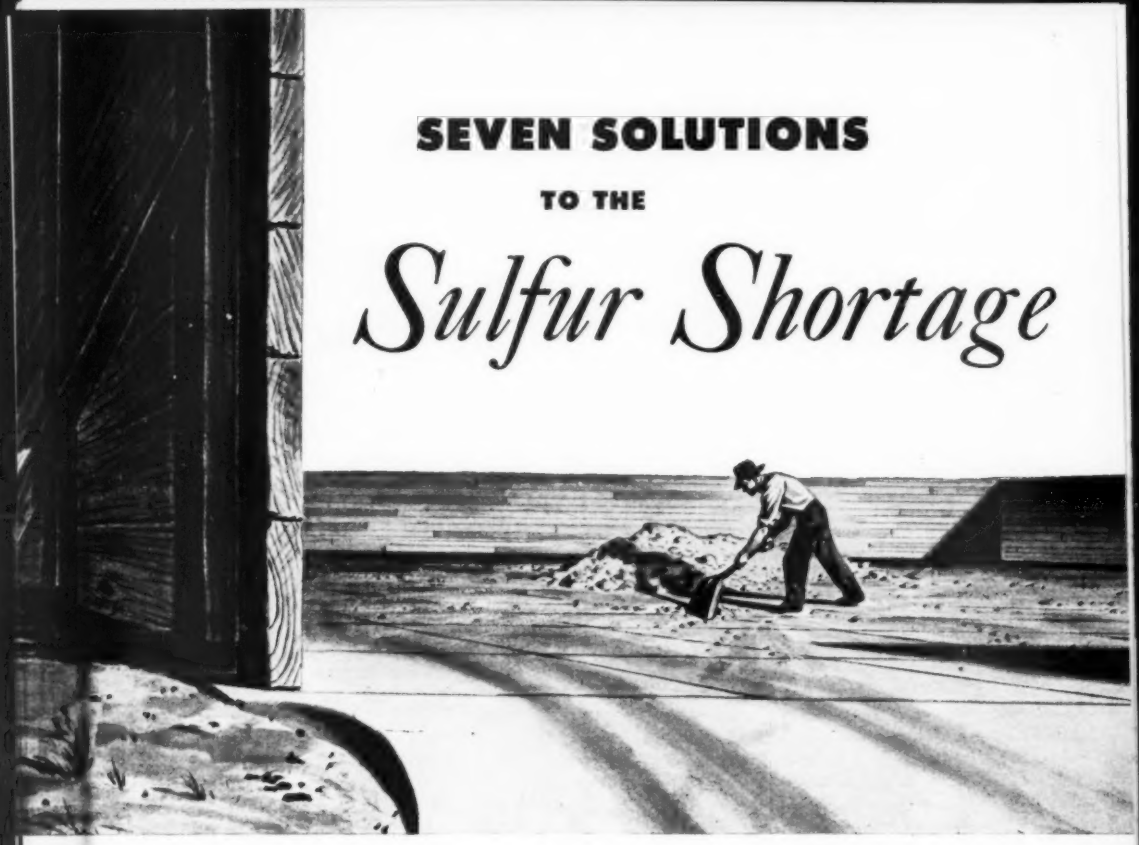
The Laterolog, introduced in October 1950, in Kansas, will be available in the United States on an industry-wide basis by January 1952. Write for further information.

Another Outstanding Development in Electrical Logging by SCHLUMBERGER

SCHLUMBERGER

SCHLUMBERGER WELL SURVEYING CORP.

HOUSTON, TEXAS



SEVEN SOLUTIONS

TO THE

Sulfur Shortage

Since sulfuric acid is vital to almost every industry, the current shortage of elemental sulfur, from which this acid is generally derived, is a serious matter and has a world-wide effect. Waste materials that can be converted into sulfuric acid and unworked sulfur bearing ores hold the answer to the sulfur shortage. Chemico offers proven processes for utilizing such sources of sulfur. If you have a source, in commercial quantities, of any of the following materials, please give us details. We will then be glad to make specific recommendations without obligation.

WASTE MATERIALS

1. Spent Alkylation Acid, a refinery by-product in the manufacture of high octane gasoline, can be regenerated into fresh sulfuric acid of any desired strength.

2. Oil Refinery Sludge is another refinery by-product resulting from the treatment of petroleum fractions. The acid content is recovered as fresh acid of high strength.

3. Waste Iron Sulfate-Acid Solutions are by-products from steel mills and titanium pigment manufacturing plants. The sulfuric acid is concentrated for re-use and the iron sulfate converted to fresh sulfuric acid.

4. Smelter Gas results from metallurgical operations where sulfide ores are roasted preliminary to the recovery of metals. The gas is cleaned and processed into fresh sulfuric acid.

5. Coke Oven, Natural and Refinery Gases contain sulfur as hydrogen sulfide. This may be reduced to sulfur or extracted directly as a raw material for producing sulfuric acid.

SULFUR BEARING ORES

6. Pyrites and other metal sulfides are roasted to produce sulfur dioxide gas which is then converted into sulfuric acid.

7. Low-grade Surface Deposits containing sulfur in elemental form are treated by a new and economically sound process which recovers the high quality sulfur necessary for modern contact plant operation.

Chemico offers 37 years of experience in the design and construction of efficient plants for the manufacture of sulfuric acid and other heavy chemicals . . . on a one-contract, one-responsibility, performance-guaranteed basis.

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. . . simultaneously, with the help of remote electrical transmission system and two-way speaker. And she keeps both Dispatch and Accounting happy with accurate, printed records!

77th ANNIVERSARY 1874 - 1951

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING. *To Petroleum Meters, the Meter Division of A. O. Smith devotes the same high standards of research and engineering which have distinguished all of the products of this firm for 77 years.*

This small plant is typical of a number of recent installations of SMITHway remote registering ticket printing systems. One rack with four S-35 350 G.P.M. meters can load two trucks at one time, another rack with two S-35 meters handles the third truck. Volume of business with limited loading rack space requires rapid dispatch of the trucks and the SMITHway system gets loading done quickly, accurately with clean, printed tickets and complete control by one girl order clerk.

There are many other "remote" installations, some using as many as 23 meters and printers. See National Petroleum News of 1/26/49; 3/8/50 and 6/13/51. Send now for complete information on how you can use the SMITHway remote registering ticket printing system to speed deliveries with less expense.

SMITHway meters are made in various sizes with *functional* equipment and accessories to suit varying requirements. All are built on the original Smith Rotary Principle, *the design that revolutionized the meter industry.*

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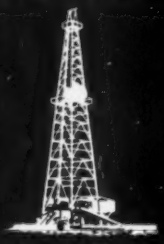
Mining Facilities

SERVICE...

Service Facilities



Laboratory Facilities

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...THROUGHOUT
THE OIL FIELDS

Dealer Facilities

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Call Magcobar first. There's an experienced and reliable Magcobar Dealer near you with a complete stock of field proved drilling muds and chemicals. And to assist you when the going gets tough, there's the Magcobar mud engineer, an expert in mud and an expert in the kind of country where you're drilling. You'll find that your Magcobar Dealer and mud engineer are on your team all the way to completion.

ONE OF THE DRESSER INDUSTRIES

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DRILLING MUD SERVICE

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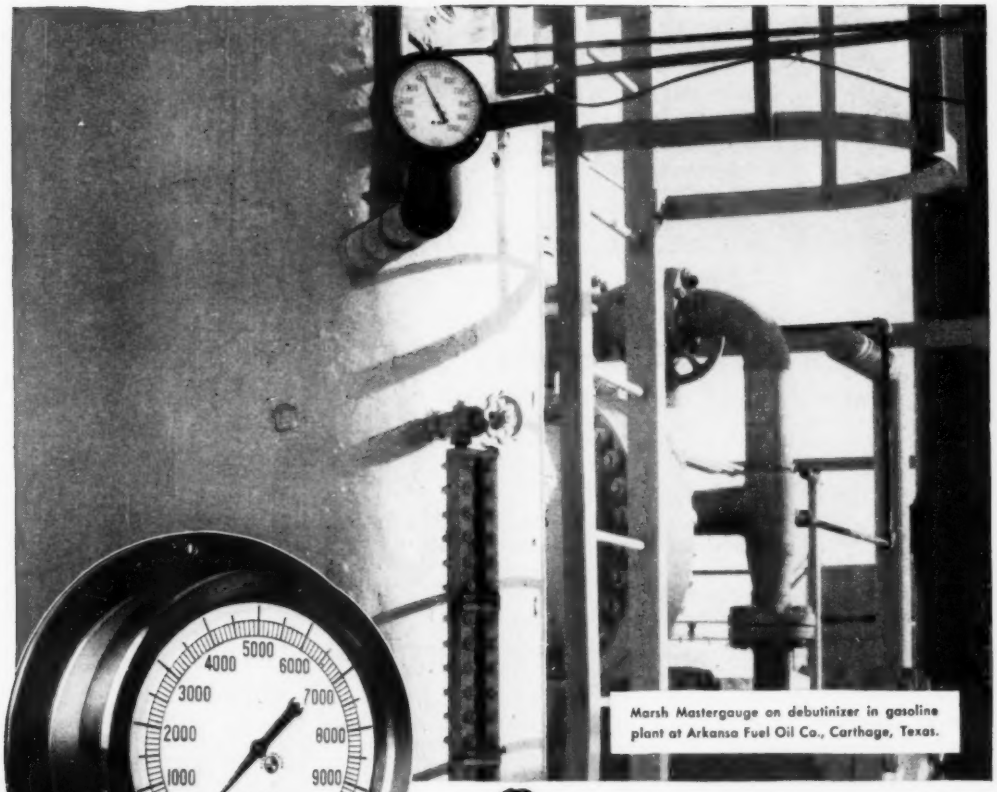


Marsh Mastergauge on debutinizer in gasoline plant at Arkansa Fuel Oil Co., Carthage, Texas.

The broad Marsh line includes gauges designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other uses in all phases of the petroleum industry.

One GAUGE YOU CAN DEPEND ON

Just put a Marsh Mastergauge to work on a tough job and you'll find there is one rugged individualist that you can depend on — *always*.

Yes, the Jas. P. Marsh family of oil industry instruments comprises a group of better gauges ideally fitted to their jobs — the Mastergauge, Christmas Tree Gauge, Oil Country Boiler Gauge, Mud Pump Gauge, Hydraulic Gauge, and so on down the formidable list.

They were bred and reared for the oil country . . . designed and developed to go beyond all former gauges in meeting the challenge of oil field conditions — conditions often more arduous than in any other branch of industry. How well they have succeeded is attested by the unprecedented growth of Marsh sales wherever there is oil.

Ask your supply store for facts about Marsh Gauges, or write for your copy of oil industry bulletin.

MARSH INSTRUMENT COMPANY

Sales affiliate of Jas. P. Marsh Corporation • **DEPT. L, SKOKIE, ILLINOIS**

★ **THE MARSH BRANCH PLANT AT HOUSTON** offers shipment from stock and facilities for repairing all makes of gauges. It is located at 1121 Rothwell Street.

MARSH STOCKED by Your Local Supply Store **GAUGES**

Thermoid
Industrial
Rubber Products
Quality Value Service

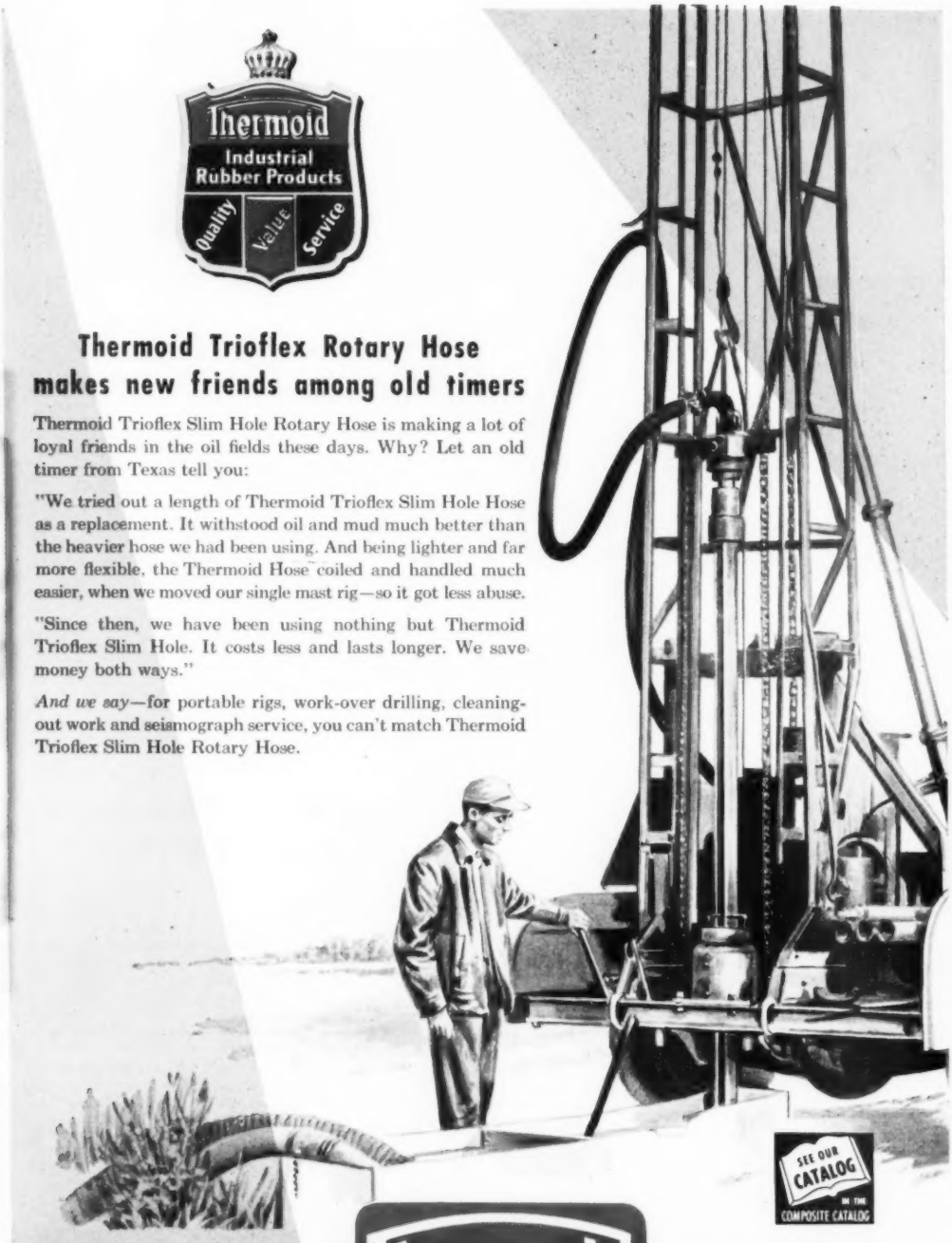
Thermoid Trioflex Rotary Hose makes new friends among old timers

Thermoid Trioflex Slim Hole Rotary Hose is making a lot of loyal friends in the oil fields these days. Why? Let an old timer from Texas tell you:

"We tried out a length of Thermoid Trioflex Slim Hole Hose as a replacement. It withstood oil and mud much better than the heavier hose we had been using. And being lighter and far more flexible, the Thermoid Hose coiled and handled much easier, when we moved our single mast rig—so it got less abuse.

"Since then, we have been using nothing but Thermoid Trioflex Slim Hole. It costs less and lasts longer. We save money both ways."

And we say—for portable rigs, work-over drilling, cleaning-out work and seismograph service, you can't match Thermoid Trioflex Slim Hole Rotary Hose.



SEE OUR CATALOG IN THE COMPOSITE CATALOG

Thermoid

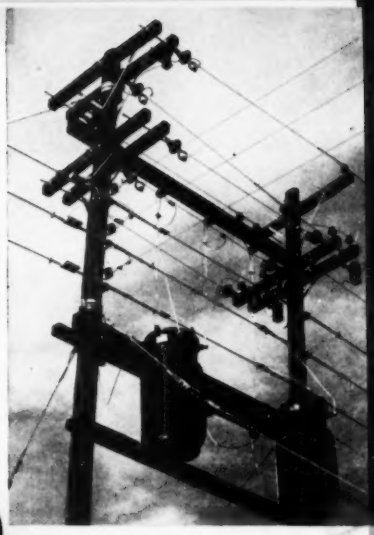
Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

You know it's RIGHT

WHEN BETHLEHEM DESIGNS YOUR LEASE ELECTRIFICATION SYSTEM



The advantages of lease electrification are now so well known that they scarcely need detailing here. But there's one big point we'd like to emphasize: the importance of proper planning and engineering. Plus, of course, the proper choice of equipment.

On both counts, Bethlehem Supply can be of tremendous service to you. Our engineers are men of long and varied experience in the planning of lease electrification. They talk the language, know the facts. They can work in complete harmony with your own personnel, from blueprint stage to the installation of the final pumping unit.

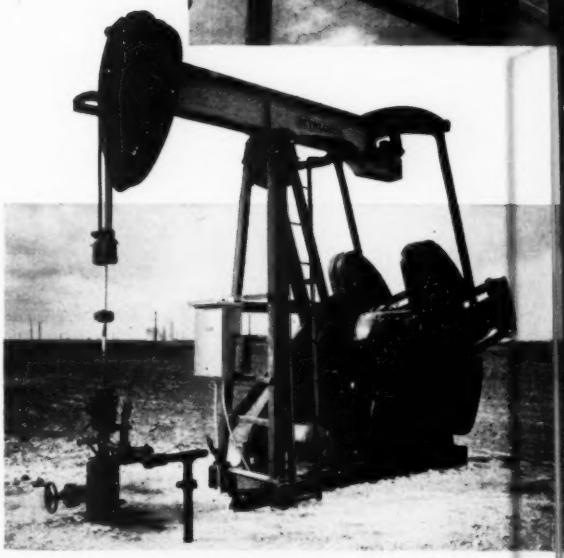
Equipment? Bethlehem handles complete turnkey jobs, supplying every major item needed. For instance:

GENERATING OUTFITS. Gas, diesel, or LPG power plants. Engines and generators carefully selected to meet the needs of the individual lease.

DISTRIBUTION SYSTEMS. No two alike. Each is planned to take account of local peculiarities, differences in terrain, etc.

PUMPING UNITS. Bethlehem has a size and type for every well. Time-clock operation recommended.

DOWN-HOLE EQUIPMENT. Includes sucker rods of proper specifications; the right type of bottom-hole pump.



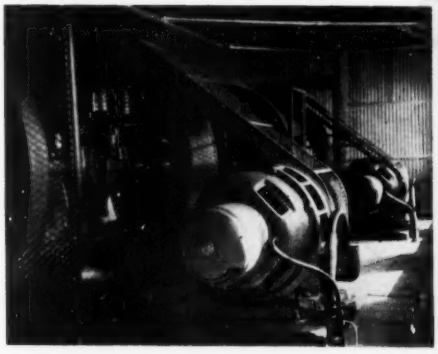
When next planning lease electrification, make use of Bethlehem's solid experience in this kind of work. You'll find we have our feet on the ground, and we'll be glad to co-operate with you and your staff in every way.

BETHLEHEM SUPPLY COMPANY

General Offices: **21 E. Second St., Tulsa, Okla.**

West Coast Headquarters: Los Angeles, Calif.

Export Distributor: Bethlehem Steel Export Corporation



Call us, too, for technical advice on water-flooding service. If you're interested in knowing more about it, we'd like to be of help!

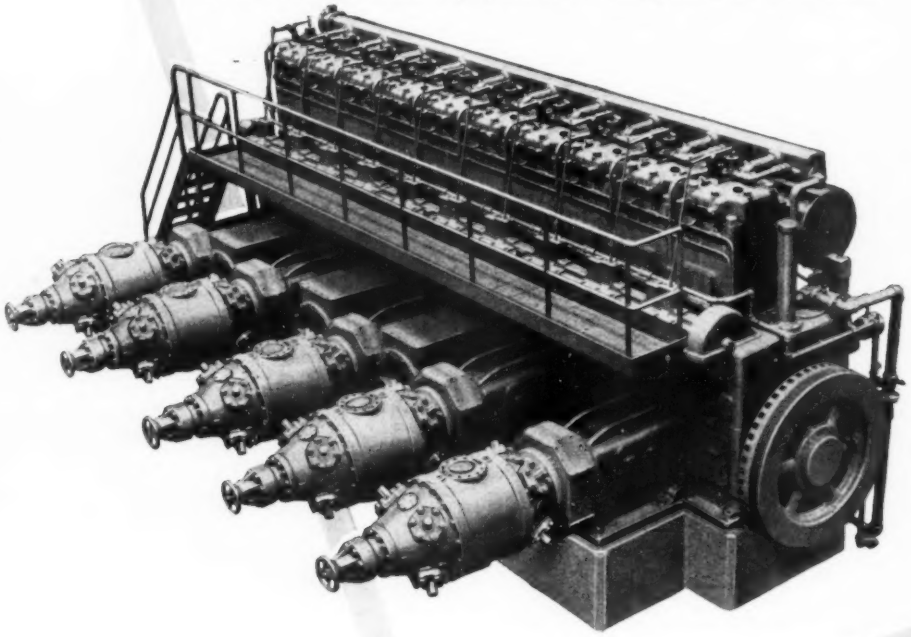
BETHLEHEM STEEL

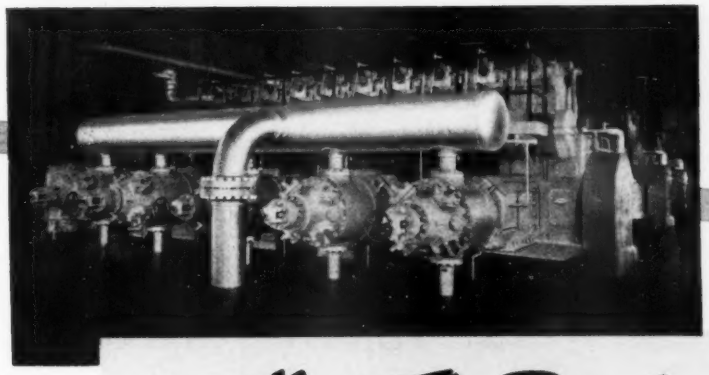
Service Record Verifies

LOW MAINTENANCE of

CLARK "BIG ANGLE" COMPRESSORS

in Texas Gas Transmission Co.
Greenville, Miss. pipeline compressor station.





Texas Gas Transmission Co. Greenville, Miss., pipeline compressor station consisting of 4 Clark HBA-10 compressors.

Here's The Record

AFTER FIRST 5000 HOURS' OPERATION

COMPRESSOR CYLINDER VALVES —Out of 160 valves, only 5 have been serviced.

POWER CYLINDER SCAVENGING PORTS—No carbon formation visible.

BEARINGS — No adjustments needed.

POWER PISTONS AND POWER CYLINDERS—In perfect condition.

Compressing 400 million cu. ft. of gas, to serve 122 communities, is the *daily* assignment of Texas Gas Transmission Co.'s pipeline compressor station in Greenville, Miss.

. . . and bearing the single responsibility at Greenville are 4 Clark High Compression, 10-cylinder, Big Angle, Gas-Engine-Driven Compressors of 2200 bhp each.

But, the fact that these Clark units passed their first seven months' service with a minimum of maintenance hours and manpower is only half the story. Considerable, initial investment was saved, too, in foundations, piping and the building itself. By reason of the HBA's large bhp in so simplified a design, Texas Gas was able to meet its requirements with fewer units and in a relatively small space.

Your nearest Clark representative is prepared to furnish complete design details and literature. Consult.

SEE the difference in...

CLARK®

COMPRESSORS

CLARK BROS. CO., INC. *One of the Dresser Industries* **OLEAN, N. Y.**

NEW YORK • TULSA • HOUSTON • CHICAGO • BOSTON • WASHINGTON • LOS ANGELES • BIRMINGHAM • DETROIT
SALT LAKE CITY • SAN FRANCISCO • BUFFALO • LONDON • PARIS • VARESE, ITALY • ANKARA, TURKEY
BUENOS AIRES • CARACAS, VENEZUELA • LIMA, PERU • BOGOTA, COLOMBIA • NEW DELHI, INDIA

In Republic Electric Weld Line Pipe, *uniformly round ends* match perfectly.

Uniform diameter speeds joint welding.

Uniform wall thickness means dependability in every inch.

Uniform high yield strength permits building of higher pressure lines.

Uniformly straight lengths line up evenly.

High ductility steel simplifies *field bending.*

Low carbon steel *welds readily.*

Freedom from scale protects against clogged valves.

Long lengths reduce number of joints.

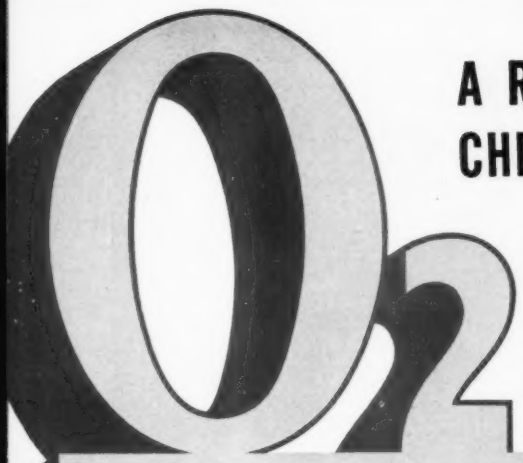
Inside and out inspection guards against hidden defects.

Over 59,000 miles of Republic Electric Weld Line Pipe placed in service during the past 22 years—in transmission, distribution, collecting and product lines—prove its dependability. Write for literature.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic
REPUBLIC STEEL
ELECTRIC WELD LINE PIPE

Other Republic Products include Casing and Tubing—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes



A REACTIVE AND IMPORTANT CHEMICAL "BUILDING BLOCK"

with constantly mounting applications in many industrial fields

CHEMICAL AND PHYSICAL PROPERTIES OF OXYGEN

Chemical Symbol	O_2
Atomic Number	8
Periodic Group	VI
Atomic Weight	16.00
Molecular Weight	32.00
Molecular Diameter	3.39×10^{-8} cm
Isotopes	16, 17, 18
Allotropes	Ozone (O_3)
Valence	2 and 6
Concentration in Dry Air	20.93%
Boiling Point (atm. press.)	—183.1°C
Melting Point	—218.8°C
Critical Temperature	—118.8°C
Critical Pressure	49.7 atm.
Critical Density	0.430 gm/cc

Vapor Pressure at Various Temperatures:

Pressure mm. Hg	Temperature °C.
0.76	—219.8
7.60	—211.5
76.0	—200.6
190.0	—194.3
380.0	—189.0
760.0	—183.1

Latent Heat of Vaporization	1635.8 cal./mol.	@ B.P.
Latent Heat of Fusion	106.0 cal./mol.	@ M.P.
Heat of Reaction with Carbon (Coke)	97,000 cal./mol.	
Heat of Reaction with Carbon (Graphite)	94,400 cal./mol.	
Heat of Reaction with Hydrogen	68,317 cal./mol.	

Boiling Points of O_2 - N_2 Mixtures: 1 atm. Pressure

O_2%	BP °K
90	87.7
95	88.9
98	89.9
99	90.0
99.5	90.1

Entropy:	T °K	Cal / gm mole °K
1 Atm.	50	12.52
	100	40.58
	150	43.31
	200	45.36
	250	46.84
	273.1	47.75
	298.1	48.04

Molal Volume: 0° C, 1 atm. (g) 22,397 cc

Specific Gravity:	@ 0° C (g)	1.429
	@ —182.9° C (l)	1.14
	@ —252.5° C (s)	1.426
Specific Heat:	BP to 25°C (g)	6.98 cal/gm mol.
	—183° to —200°C (l)	12.62 cal/gm mol.
	—221.8°C (s)	10.74 cal/gm mol.
Coefficient of Thermal Expansion:	0° C to 100° C (g)	3.674×10^{-3}
	—195° C (l)	4.10×10^{-3}

Compressibility Factor: $PV = 1.0$ @ 1 atm., 0° C

P, atm.	0°C	50°C	100°C	200°C
1	1.0000	1.1838	1.3674	
10	0.9913	1.1796	1.3661	
50	0.9569	1.1642	1.3630	
100	0.9234	1.1520	1.3651	
200	0.9140		1.4000	1.8190
300	0.9625		1.4530	1.8850
400	1.0515		1.5320	1.9610
500	1.1560		1.6220	2.0500

$\frac{C_p}{C_v}$ (atm. pressure)

0°C.	$\frac{C_p}{C_v}$
15	1.401
—76	1.415
—181	1.45

Vanderwaal's Constants: $a = 1.360$ (liter^2, atm. mole^{-2}); $b = 0.03183$ (liters, mole^{-1})

Solubility in Water: 4.89 cc in 100 cc @ 0° C; 2.6 cc in 100 cc @ 30° C; 1.7 cc in 100 cc @ 100° C

Viscosity: @ BP (g) 0.00736 CP; @ MP (l) 0.883 CP; @ 0° C (g) 0.0192 CP; @ —193° C (l) 0.245 CP

Moisture Content of Saturated Oxygen .130 gm/ft³ @ 0°C

Thermal Conductivity:

	cal. / cm-sec-°C
0°C (g)	5.7×10^{-5}
—78.4°C (g)	4.29×10^{-5}
—191.4°C (g)	1.72×10^{-5}

Index of Refraction: —181°C (g) 1.221

Remember that oxygen is one of the least expensive elements available in pure form, and is finding increasing use in more and more fields. As supplier or user, remember that Chemical Plants builds complete production units in all commercial sizes—based on the processes of Gesellschaft fuer Linde's Eismaschinen, A. G.

CHEMICAL PLANTS DIVISION

BLAW-KNOX CONSTRUCTION COMPANY

PITTSBURGH • TULSA • NEW YORK • PHILADELPHIA • CHICAGO • BIRMINGHAM • WASHINGTON, D. C.

From HEAD to SHOE

Back pressure valve connected to top plug.

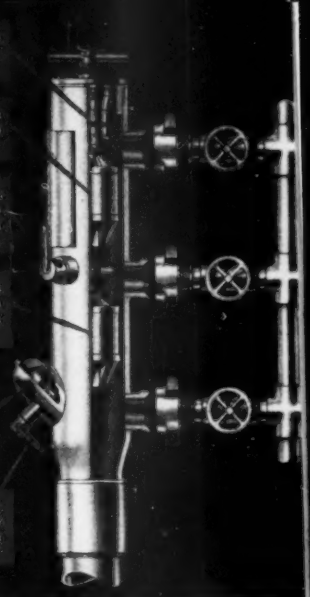
Top plug rides cement column down the casing.

Plug bar releases bottom plug without shutting down or opening head.

Bottom plug leads cement column and wipes casing clean of mud.

Trip ball that ejects float assembly in shoe to provide full casing-bore discharge.

Ball dropper releases trip ball without opening head.



RECTOR FULBORE CEMENTING METHOD

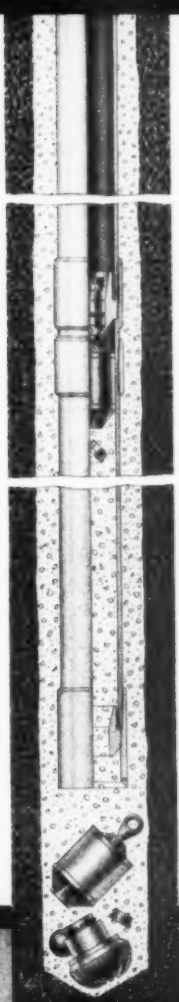
prevents contamination of cement

Every operator knows that voids caused by air pockets in the cementing string or soft spots due to contamination are the perfect set-up for future trouble. Prevention of these weaknesses is the basis of "Fulbore" cementing superiority . . . the assurance of a master cementing job, everytime.

The "Fulbore" multiple inlet head provides a closed circuit from beginning to end of cementing operations. The two plugs, made up in the head before it is connected to the casing string, are released mechanically without downtime. the plugs completely and effectively segregate the cement from the time it enters the head until discharged at the shoe. There is no possibility of contamination or the formation of air pockets.

Extreme simplicity is another advantage of "Fulbore" cementing. There are no discs to break . . . no small orifices through which the cement must be pumped. Traveling ahead of the cement, the bottom plug is pumped out of the casing through the float shoe from which the float assembly has been ejected after cementing string has been floated into position. This provides full casing discharge capacity . . . reduces the load on the pumps . . . permits greater volume to be circulated with same pump discharge pressure . . . results in higher velocity in space between casing and bottom of hole.

Every phase of "Fulbore" cementing is planned to make every job a master cementing job. Ask your Rector Representative or authorized supply store for full information about "Fulbore" Cementing and equipment.



RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER ★

1400 NORTH COMMERCE ST. FORT WORTH, TEXAS

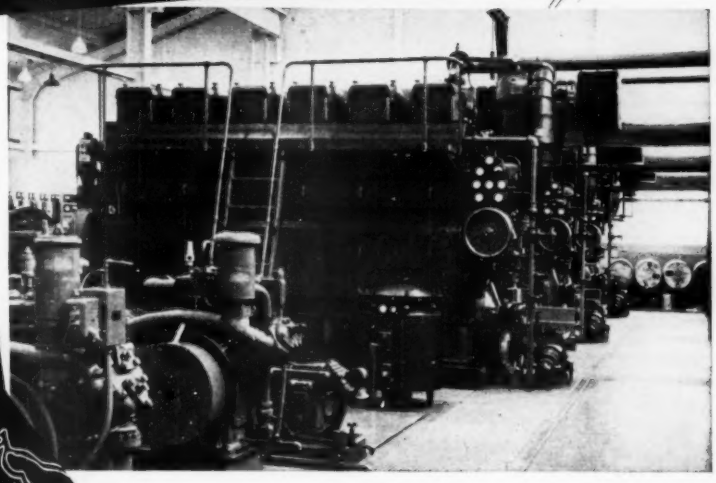
Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTOR FULBORE CEMENTING METHOD RECTORSEAL

How "TAPLINE" is powered to bring oil across SAUDI ARABIA

Some of the 40 Worthington Supercharged Diesels installed at five stations along Tapline, operated by the Trans-Arabian Pipeline Co. Other Worthington equipment on this project includes centrifugal refrigeration compressors for air conditioning.



Worthington Diesel Engines Selected In The Largest Single Peacetime Diesel Contract Ever Awarded

Worthington Diesels were the choice for "Tapline", the huge, recently completed engineering project that is carrying oil from the oil-rich Persian Gulf area across the Saudi Arabian Desert to the Mediterranean — bringing a vital commodity 3,500 miles and 10 days nearer to European markets.

Fueled by crude oil bled from the line, 40 Worthington Diesels, at five stations along the 1068-mile system, are an unfailing source of economical, trouble-free power. Their services include pumping oil through the line (over 13 million gallons daily), generating power for 10 centrifugal compressors used for air conditioning the maintenance quarters, for pumping tremendous quantities of water needed at each station, and for lighting the communities at the stations — each of which has electrical requirements equal to an American town of 7,000 population.

Everywhere In The World . . .

Worthington Diesels on pipeline duty and in many other services are proving that this company's pioneering in Diesel building and development pays off in better, lower-cost engine performance. For further facts proving *there's more worth in Worthington*, write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

SEE OUR CATALOG in the COMPOSITE CATALOG

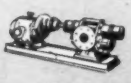
WORTHINGTON

YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

Balanced Angle Compressors



Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

Looking for tubes with a better life/cost ratio? Ask the experts!

This month's report is on: **SILMO**

Offers good combination of high temperature strength and oxidation resistance. At 1000°F. — 1150°F., it has about twice the strength of carbon steel and oxidation resistance comparable to 4-6 Cr. Mo. For use in cracking furnace, heater, high pressure boiler and superheater tubes.

ONE OF 23 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

*Not available as seamless tubing at the present time.

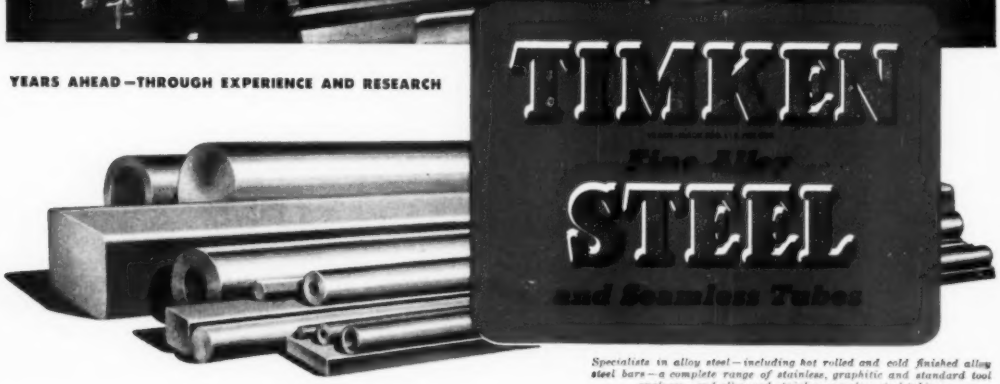
If your high temperature tubes either fail too soon or last longer than needed, they're costing you too much. Only *one* high temperature steel can give you the best life/cost ratio. It's the one that's tailor-made for your particular operating conditions.

To make sure you get the *right* steel, consult the recognized authorities in this field—the Timken Company metallurgists. Their recommendations are backed by 21 years of pioneering research and the widest field experience. They have 23 analyses to choose from. And uniform tube quality is assured by our complete control from melt shop through final inspection.

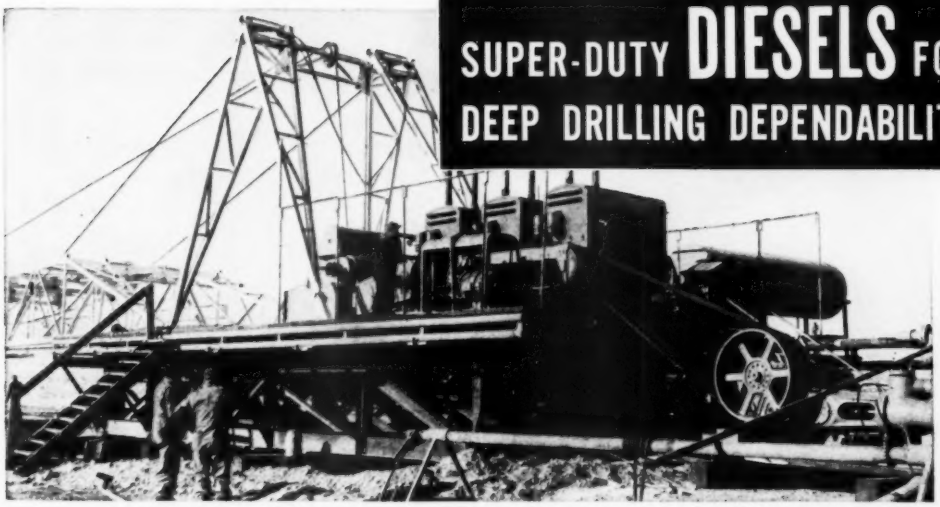
Let the Timken Company's "RSQ"—Research, Supply, Quality—solve *your* tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, O. Cable address: "TIMROSCO".

Photo shows metallographic laboratory at the Timken Company, where structural characteristics of high temperature steels are determined. The Timken Company was first to test high temperature steels, and still leads in that research today.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing



SUPER-DUTY DIESELS FOR DEEP DRILLING DEPENDABILITY

● This is a driller's Diesel. It's full of power—and dishes it out on demand—fast, flexible, and smooth! You'll get the same snappy acceleration with this Waukesha Super-Duty Diesel that a good gas engine gives you. And quick starting, in cold weather, too.

Of all its exclusive Diesel design features—the biggest is the patented combustion chamber. It's the *why* of deep drilling dependability—clean burning, lively acceleration, smooth, shock-free operation, high fuel economy with long life and low maintenance.

Other big features — hardened 7-bearing crankshaft with torsional vibration dampner; wet sleeve cylinders; oil cooled pistons, each with 4 rings, top ring chrome plated; built-in oil cooler; American Bosch injection; either electric or gasoline engine starter; and more, all pictured and described in complete detail, in Bulletins 1415 and 1418. Send for them now.

WAUKESHA Diesel OIL FIELD POWER

UNIT RIG (above and below) powered by three **WAUKESHA Super-Duty DIESEL Oil Field Power Units** (Model 6-WAKDU)—six cylinder, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displ.

WAUKESHA MOTOR COMPANY
WAUKESHA • WISCONSIN
NEW YORK • TULSA • LOS ANGELES

142

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

- One moving part.
- No internal wearing parts.
- No valves, pistons, or sliding vanes.
- No internal lubrication.
- Low maintenance.
- Slugs of liquid entering pump do no harm.
- Non-pulsating pressure.
- Saves floor space.
- 75 pounds in a single stage.

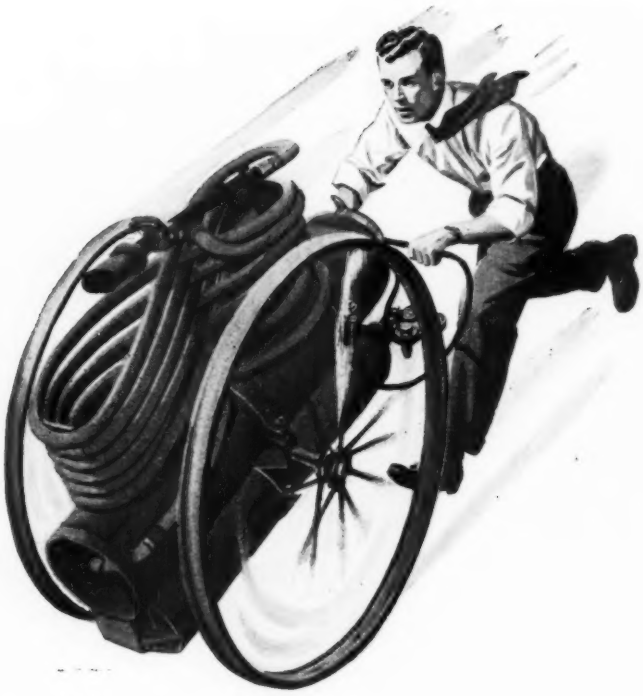
NASH ENGINEERING COMPANY
273 WILSON, SO. NORWALK, CONN.

We're hanging out the IDECO shingle!

Proud of it? You bet we're proud that the famous Ideco line of drilling, servicing and production equipment is now another good sign of SUPERIOR supplies. There are strategically located Superior stores, you know, all over the mid-continent oil area . . . stores with a complete line of nationally known brands you can depend on to do the job. So call your nearest Superior store or office when you need on-the-spot service, supplies or technical advice.

IDECO DRILLING, WORKOVER, SERVICING AND PRODUCTION EQUIPMENT

1202-04 MARSHALL STREET • P. O. BOX 1800 • SHREVEPORT, LA.



A ONE MAN "FIRE ENGINE"

—the Kidde Dry Chemical Wheeled Extinguisher

You *can* control a roaring fire in inflammable liquids, live electrical equipment, textiles or L-P gas. The Kidde 150 Pound Dry Chemical Wheeled Extinguisher packs a fire-fighting wallop that brings large fires under control quickly and easily.

The new "instant flow" hand control enables you to beat back fire with a long range "straight" stream... or to blanket the fire completely by the wider coverage which you get from the improved "fan" pattern.

One man can wheel this extinguisher through a standard doorway... apply 150 pounds of fire-smothering dry chemical in less than one minute.

Write for complete information on this new Kidde Dry Chemical Wheeled Extinguisher . . . or the full line of Kidde fire extinguishers and built-in systems.

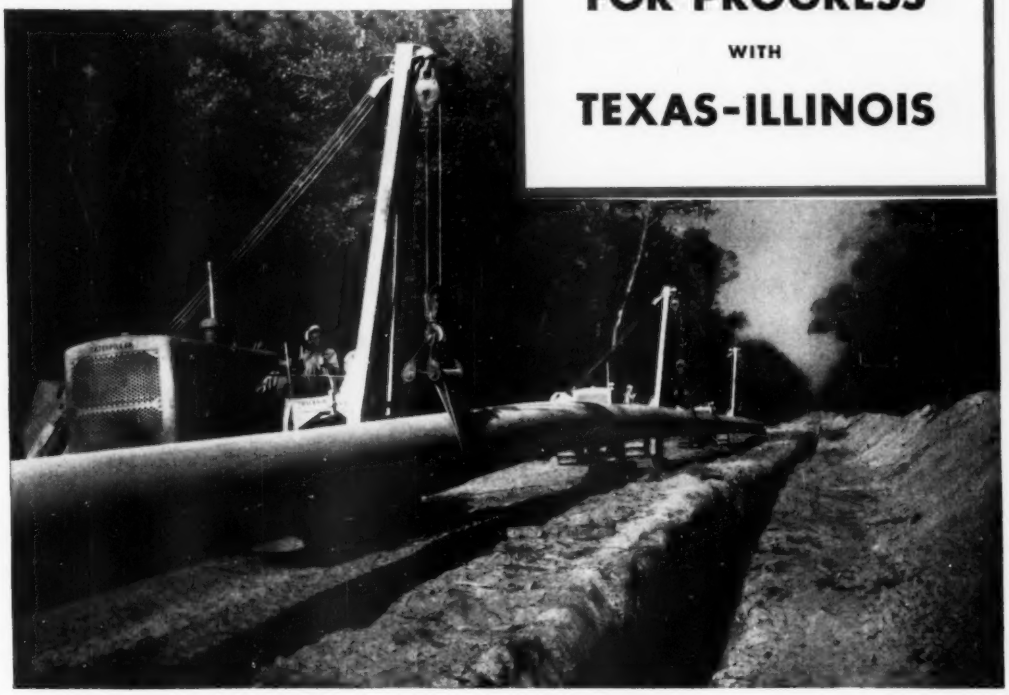
Kidde

Walter Kidde & Company, Inc., 854 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

FIRST names in pipelines depend on the FIRST* name in line pipe

*FIRSTS by A. O. SMITH • Welded line pipe • Internal expanded pipe Light wall large diameter pipe • World's largest producer of large diameter welded steel pipe

PARTNERSHIP FOR PROGRESS WITH TEXAS-ILLINOIS



Texas Illinois Natural Gas Pipeline Company's 30-inch line, which will supply Old Ocean, Chocolate Bayou and LaGloria production to Peoples Gas Light and Coke Company in Chicago, is being strung, wrapped and laid for completion this fall.

Here, again, A. O. Smith line pipe, welded and *sized true as a die* in manufacture to facilitate field welding into a continuous tube along the right of way, plays its role in a great industrial partnership for progress.

A thousand miles of large-diameter pipe, being supplied for this project, is the A. O. Smith contribution.

A. O. Smith has the productive capacity and technical skill to serve in similar partnerships throughout the petroleum and natural gas industries.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters

DEPENDABILITY *through* **RESEARCH** *and* **ENGINEERING**

77th ANNIVERSARY 1874 • 1951

A.O.Smith

LINE PIPE • CASING

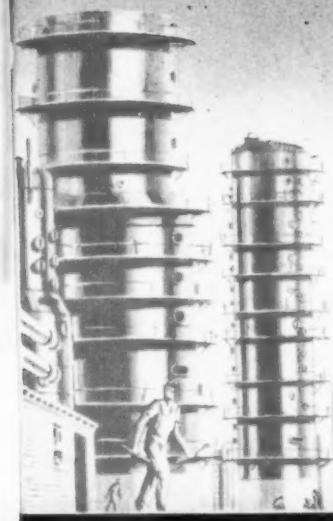
Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas
New Orleans • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1
International Division: P.O.Box 2023, Milwaukee 1

WHAT ABOUT *Wishful Thinking?*

Merely hoping a certain valve will do a required job is not enough. Maybe it will—at first. But if it's not the *right* valve in every particular—design, construction and materials—"it won't be long!"

There's a Powell Valve specially adapted to each and every flow control service. Why not always be sure with Powell?

Gate, Check, Globe and Y Valves, in Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys



Quality fine throughout "The Line"

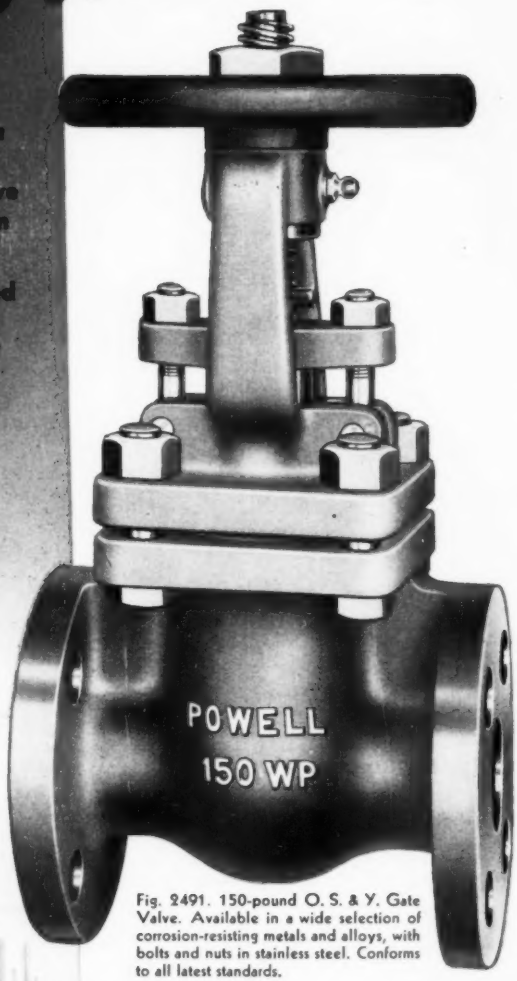


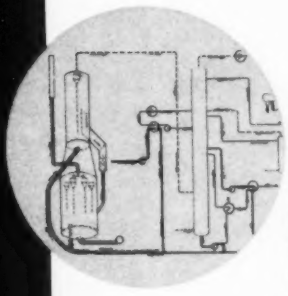
Fig. 2491. 150-pound O. S. & Y. Gate Valve. Available in a wide selection of corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Conforms to all latest standards.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

one contract

one contractor



From flow diagram to finished unit a Foster Wheeler contract provides experienced engineering service for every detailed step in the sequence of design, procurement, fabrication and construction.

...more than **500** process units have been designed and constructed by Foster Wheeler in over 30 years service to the petroleum and chemical industries.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

another complete refinery

Foster Wheeler is pleased to announce that it will design and construct a complete refinery for the Standard-Vacuum Refining Company of South Africa (Pty.), Ltd. at Durban, Union of South Africa.

The outstanding processing feature of this new refinery is a combination crude distillation-catalytic cracking-thermal reforming unit. The cracking unit will be the new Fluid design:—Model IV.

. . . another example of the FW-**1** contract complete engineering and construction service

available to refiners—anywhere in the world

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

THE GOOD EARTH *is our business..*

IN THE course of eighteen years of service to a long list of important oil producers throughout the world, Independent has accurately surveyed countless miles of the earth's subsurface. This richness in practical experience, paralleled by continuing laboratory research in the several sciences on which geophysics is built, is your assurance of profitable satisfaction with the services of Independent Exploration Co.

Party Chief W. H. Morgan has accumulated 15 years of varied experience with IX crews since he graduated from Illinois University. Every man who serves as a party chief for Independent must be well qualified, by training and field experience, to direct exploration work that is profitable for our clients.

POINTING THE WAY FOR THE DRILL

IXC

Independent *Geophysical Surveys*

EXPLORATION COMPANY

1973 WEST GRAY ★ HOUSTON, TEXAS

ESTABLISHED 1932

Bingham

PRECISION BUILT FIELD PROVEN PUMPS

Koke-Krusher

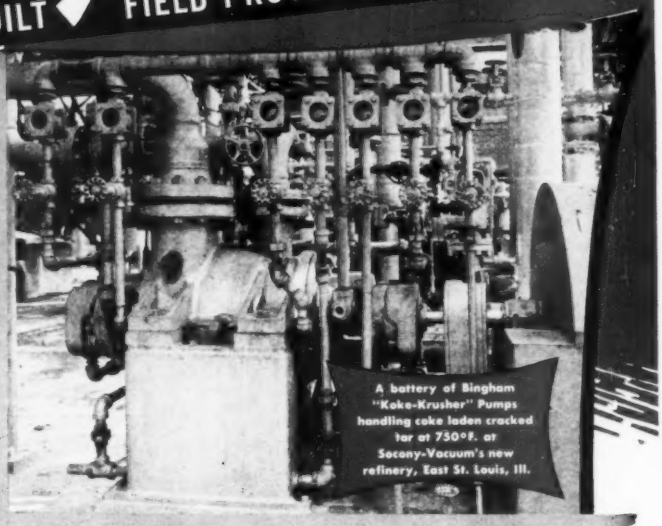
...the only pump that crushes entrained coke

This centrifugal pump does what heretofore has been considered impossible — it instantly pulverizes large pieces of coke in the pumpage by crushing. A durable, positive crushing mechanism located in the suction chamber in front of the impeller eye instantly crushes large pieces of hard coke entrained with the pumpage and pulverizes them before they can enter and clog the impeller and system equipment.

CRUSHES INSTANTLY

• • •

All Bingham Pumps are precision built in our new and modern plant. All rotating parts are dynamically balanced. All parts requiring close tolerances are ground on heavy duty precision grinders.



A battery of Bingham "Koke-Krusher" Pumps handling coke laden cracked tar at 750°F. at Socony-Vacuum's new refinery, East St. Louis, Ill.

One of the heavy duty precision grinders in our new modern plant.

SEND NOW

For Exhibit Box

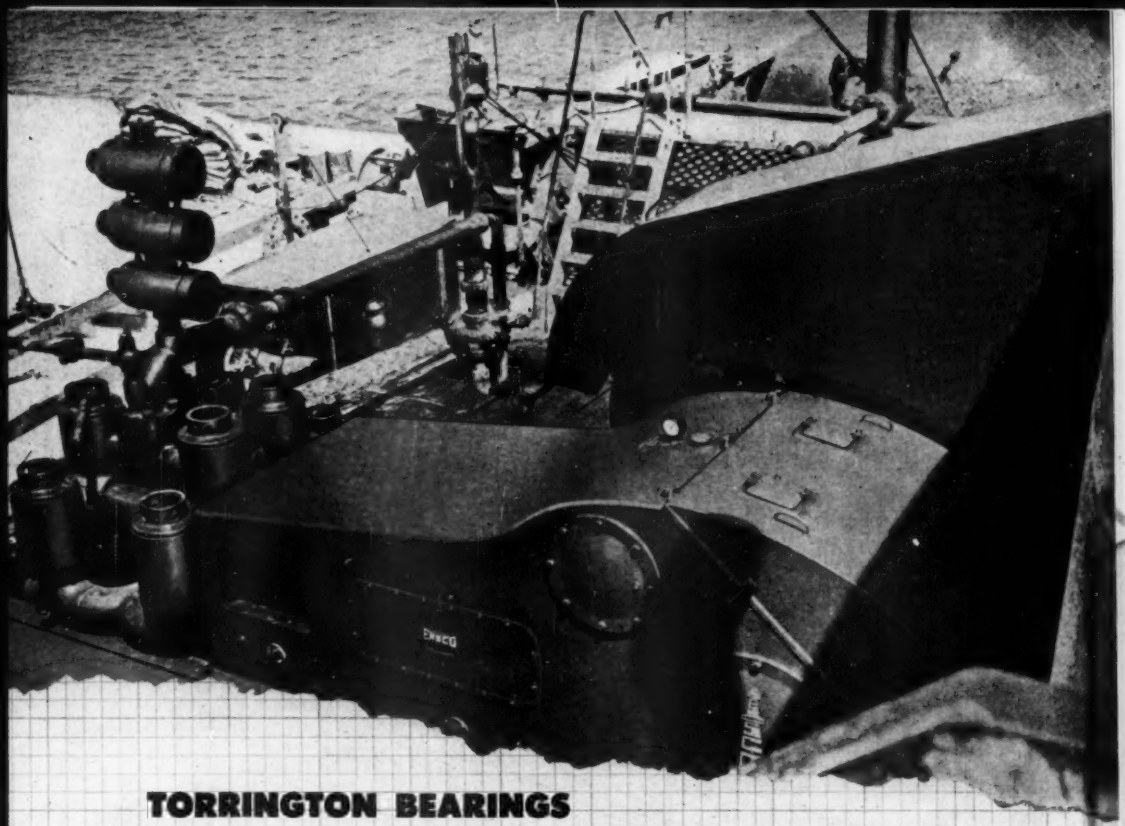
Contains sample of hard coke before and after entering Koke-Krusher. Also Bulletin 106 giving 12 reasons why it is sound economy to use the Koke-Krusher in new and to replace old installations.

Bingham — DOUBLE VOLUTE RADIAL BALANCE — PUMPS — SINCE 1921

GENERAL OFFICES:
705 S.E. Main Street
Portland, Oregon

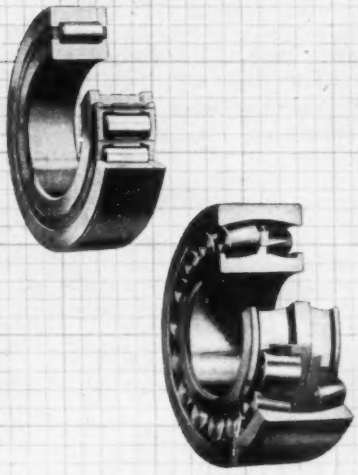
FACTORIES:
Portland, Oregon
Vancouver, Canada

Sales and Service Offices: BOSTON, MASS., 113 Broad Street • CHICAGO, ILL., 275 Old Colony Bldg., 407 South Dearborn Street • HOUSTON, TEX., 1206 Union National Bank Bldg. • MIDDLETON, OHIO, 505 Federal Savings & Loan Bldg. • NEW YORK CITY, N. Y., 611 Graybar Bldg., 420 Lexington Ave. • PITTSBURGH, PENN., 102 Mt. Lebanon Blvd. • SAN FRANCISCO, CALIF., 420 Market St. • SEATTLE, WASH., 316 Joseph Vance Bldg., 1402 Third Ave. • ST. LOUIS, MO., 2533 Salem • ST. PAUL, MINN., 205 South Robert St. • TULSA, OKLA., 200-206 N. Denver St. • VANCOUVER, CANADA, 3550 E. Broadway.



TORRINGTON BEARINGS

...aid faster, deeper, cheaper drilling



Emsco D-850, largest duplex slush pump ever built, provides the high fluid volume pressures required for jet bit drilling, which is reported to be reducing hole costs as much as $1 per foot.

Torrington Spherical Roller Bearings are used on the main shaft. The radial and thrust load carrying characteristics of these heavy-duty bearings assure reliable, trouble-free operation. Their compactness is an aid to simplifying design.

Also contributing to smooth, efficient performance of these giant pumps are Torrington Radial Roller Bearings on the eccentrics and Type NCS Needle Bearings on the crossheads.

Added dependability can be built into your equipment, too, with Torrington Bearings. Our years of experience in designing and producing all major types of anti-friction bearings are available to you. Call in a Torrington engineer to help solve your next bearing problem.

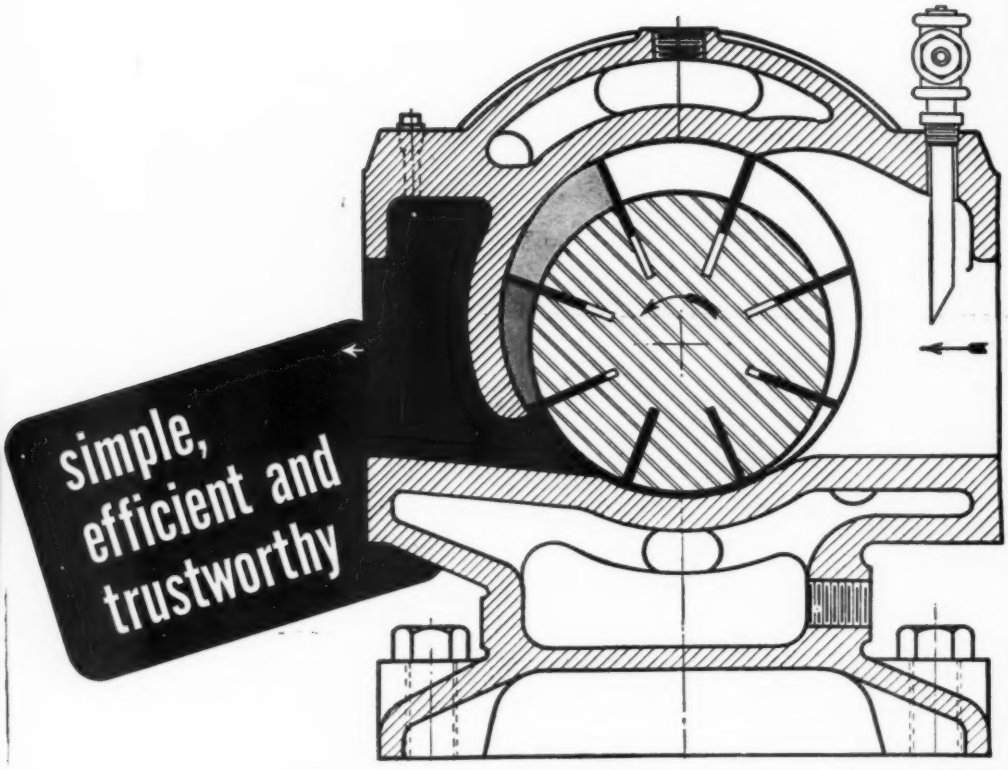
THE TORRINGTON COMPANY

South Bend 21, Ind. • Torrington, Conn.

District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON BEARINGS

SPHERICAL ROLLER • TAPERED ROLLER • STRAIGHT ROLLER • BALL • NEEDLE • NEEDLE ROLLERS



the FULLER ROTARY COMPRESSOR

For compressing gas, no reciprocating compressor can compare in simplicity and operation with a rotary.

PRINCIPLE IS SIMPLE

An eccentrically mounted, accurately machined rotor, with integral shaft, is supported on roller bearings in each of the heads. The eccentric rotor mounting leaves a crescent-shaped space, which is divided into compartments by wear-compensating blades. These slide freely in milled slots in the rotor, and are held, pressure tight, against the cylinder solely by centrifugal force. These compartments vary from minimum to maximum on the suction side, and from maximum to minimum on the compression half of the revolution. Properly designed blades, and a wide seal between rotor and bottom of cylinder, assure high and **maintained** volumetric efficiency; the multiple blades minimize pressure differences between compartments and contribute to maximum output with minimum wear.

OPERATION IS EFFICIENT

The Fuller Rotary Compressor assures a smooth flow, with no pulsations ... numerous displacement deliveries per revolution as against one in a single-cylinder piston compressor. Other advantages are: Direct drive; Compact installation; Simple foundations; Maintained capacity and efficiency; and No valves to leak. Because there are few moving parts —rotor, blades, and bearings, **maintenance time and costs are negligible.**

For further information on Fuller Rotary Compressors that will do a better job for you, write for Bulletin C-5.

Fuller

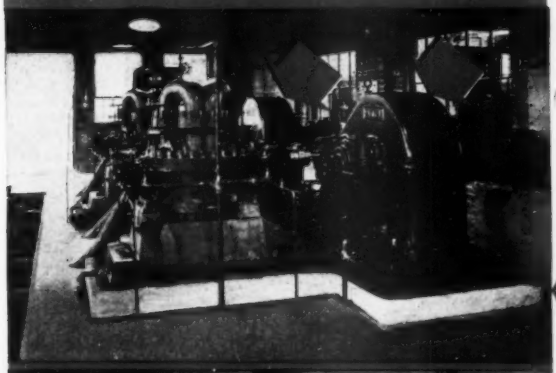
DRY MATERIAL CONVEYING SYSTEMS
AND COOLERS • COMPRESSORS AND VACUUM PUMPS
FEEDERS AND ASSOCIATED EQUIPMENT

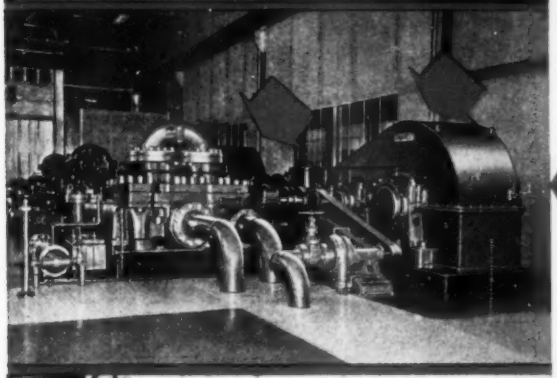
FULLER COMPANY
Catasauqua, Pennsylvania
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

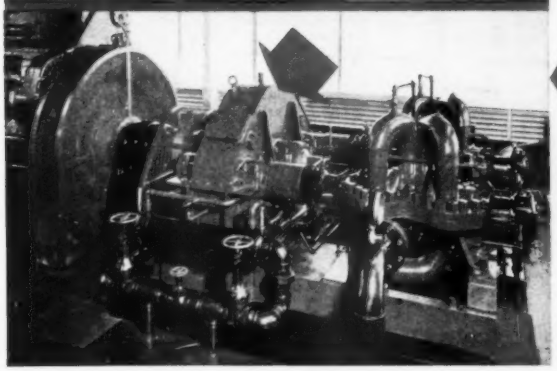
C-218

SUPPLYING THE IDEAL SPEED INCREASER FOR THE JOB

is a Farrel specialty







Since 1932, Farrel has worked closely with the oil industry in developing speed increasers to meet normal as well as unusual requirements.

The remarkable performance record of the hundreds of these units now in service has established a virtual guarantee of satisfaction. All of them, including the first installed 19 years ago, are still operating successfully.

Farrel Type SI units were the first speed increasers to be placed on the market in a standard series. The modern SI line consists of 49 standard sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1. Two-pinion units, designed to transmit power from a single engine to two pumps, are also available.

For further information, send for a copy of Bulletin No. 448A. No cost or obligation.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans

FB-659

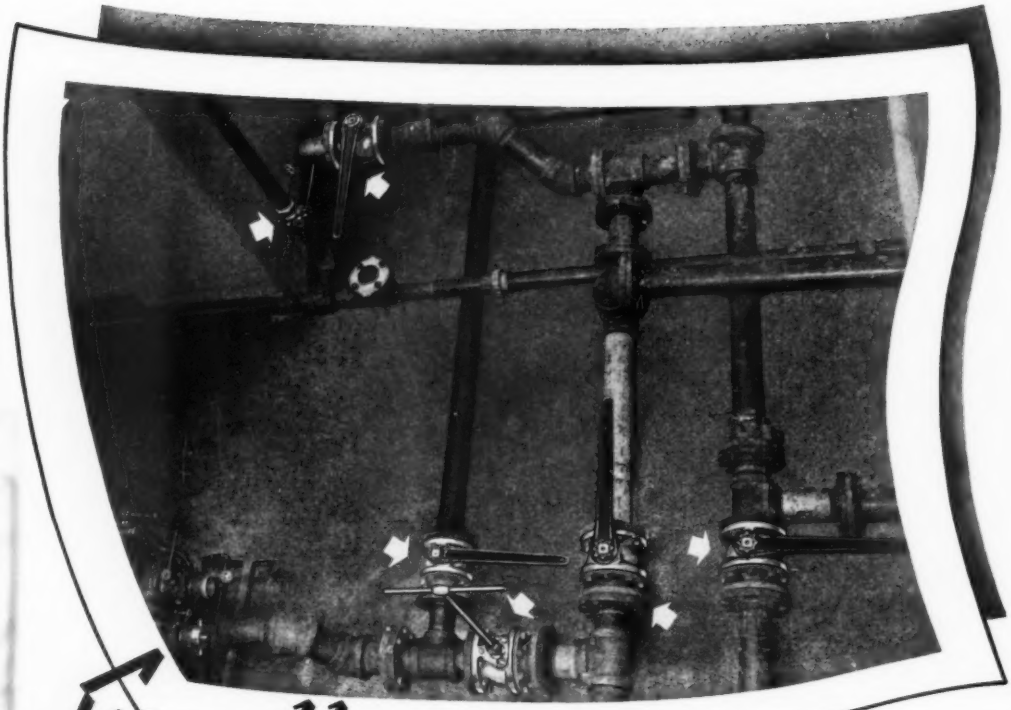
SINGLE STEP-UP UNITS
transmitting 300 HP from internal combustion engines to centrifugal pumps.

DOUBLE STEP-UP UNITS
transmitting 1300 HP from 240 RPM engines to pumps operating at 3150 RPM.

TWO-PINION UNIT
delivering 300 HP to each of two pumps from a single 600 HP engine.

OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 860-A M&M Building, Houston 2, Texas

Farrel-Birmingham®



Exactly RIGHT FOR THE JOB . . .

ROCKWOOD Ball VALVES

Wherever a rugged, longer lasting, quick opening and closing valve is needed, Rockwood Ball Valves will fill the bill perfectly. The full *round* flow, leak proof service, and no maintenance features of the Rockwood Ball Valve assures around the clock performance. Rockwood Ball Valves are already giving outstanding service in oil refineries, food, paper, textile, chemical and rubber plants . . . and many more! The group of Rockwood Ball Valves shown above controls the flow of water and various chemicals in a large testing laboratory.

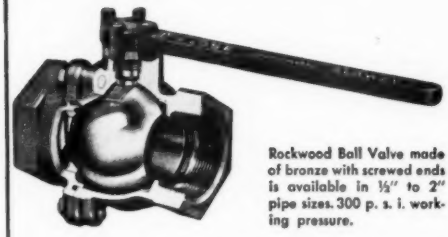
Positive shut-off of every valve is important at all times.

Seeing is believing — convince yourself by installing Rockwood Ball Valves in your plant, today. Send for folder V-4.

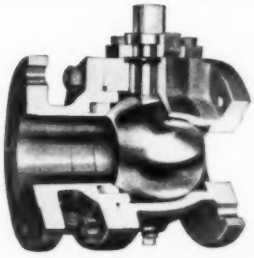
Distributors in all principal cities.

ROCKWOOD

ROCKWOOD SPRINKLER CO.
104 HARLOW ST., WORCESTER 5, MASS.



Rockwood Ball Valve made of bronze with screwed ends is available in ½" to 2" pipe sizes. 300 p. s. i. working pressure.



Rockwood Cast Steel Ball Valve available in 3" and 4" pipe sizes. Recommended for refinery, pipe line and general use. 300 W. O. G.

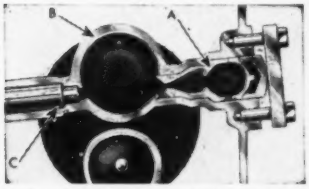
CONTINENTAL MOTORS

Powerful as the Nation

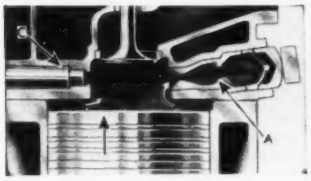
AMERICA'S STANDARD

Here's the "Inside Story" of

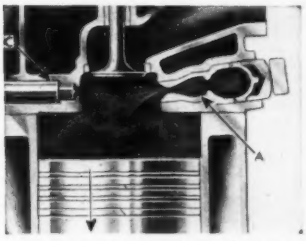
CONTINENTAL CUSHIONED POWER



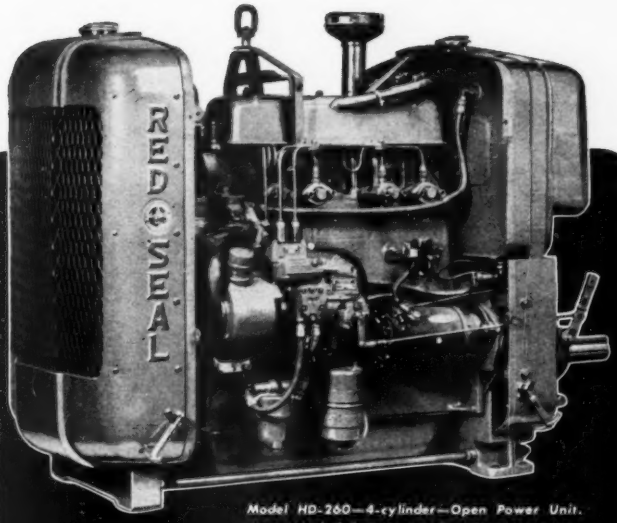
Top view of combustion chamber, showing Dyna-Cell (A), turbulence chamber (B) and nozzle (C). A definite portion of fuel charge from nozzle enters Dyna-Cell.



Fuel charge is self-ignited by pressure just before piston reaches top of compression stroke. But pressure developed by the fuel within the Dyna-Cell is absorbed momentarily by the latter . . . .



. . . to be released through metered opening during the piston's downstroke. Thus, peak pressures are converted into useful "follow-through" power.



Model HD-260—4-cylinder—Open Power Unit.
25 to 50 shaft horsepower for intermittent duty.
20 to 40 shaft horsepower for continuous duty.

RED SEAL CUSHIONED POWER DIESELS COST LESS TO RUN AND TO MAINTAIN

Continental Cushioned Power Combustion Chamber with Dyna-Cell (see diagrams at left) not only gets ALL the power from the fuel, but smooths and prolongs the power impulse, preventing the development of destructive peak pressures usual in engines of Diesel type. This avoidance of extreme pressures lengthens engine life. It speeds and simplifies service, by permitting wide interchangeability of parts between Red Seal Diesel and gasoline models. Moreover, the weight-to-horsepower ratio is unusually favorable, a consideration of great importance in many applications. Choose Continental Cushioned Power Diesels for lower costs . . . longer useful life.

REMEMBER, GOOD EQUIPMENT IS BETTER WITH CONTINENTAL RED SEAL POWER

Continental Motors Corporation

MUSKEGON, MICHIGAN

6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS . . . 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.

See PEERLESS FIRST!
For GAS SCRUBBERS...
An installation of two 48 x 19 Peerless Scrubbers, each handling 50 million cubic ft. of gas a day at 250 PSI on the inlet of a power plant in South Texas.

The ***BEST SCRUBBERS*** for PIPELINES, GATHERING SYSTEMS, COMPRESSOR STATIONS, PLANT INLET SCRUBBERS

With Peerless Scrubbers you can rely on Maximum Efficiency with Minimum Pressure Drop. These precision engineered scrubbers are available in both vertical and horizontal sizes or can be built to your requirements . . . For Any Gas Flow . . . For Any Working Pressure.

Each Peerless Scrubber is designed and built around the famous Peerless Mist Extractor Unit, which guarantees the liquid entrainment loss to be less than 1/10 gal. per million standard cubic feet of flowing gas.

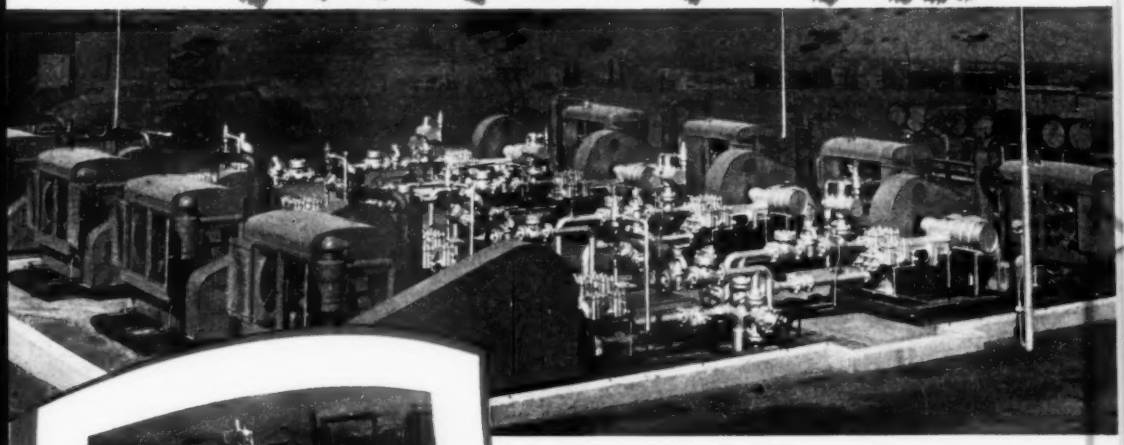
PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 7193 ★ DALLAS, TEXAS ★ DIxon-8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

We help to feed RICHFIELD's $7,000,000 "Baby"



BIG pipe lines like Richfield's, once laid, become fixed and permanent installations. It is the feeder lines that provide flexibility and expansibility, and that's where Gaso Pumps come into the picture.

They help to feed main lines by powering the auxiliary lines that reach out into tank farms, field storage and other source-points of oil.

Used singly or in batteries, Gaso Pumps are adaptable to any requirements. Their portability permits transfer when necessary to meet changed conditions. And their performance record assures the kind of service realistic pipe line engineers look for.

GASO PUMP & BURNER MFG. CO.

902 EAST FIRST ST., TULSA, OKLA.

EXPORT OFFICE: 149 BROADWAY, NEW YORK

Shreveport: W. L. Somner Co., 419 Lake Street

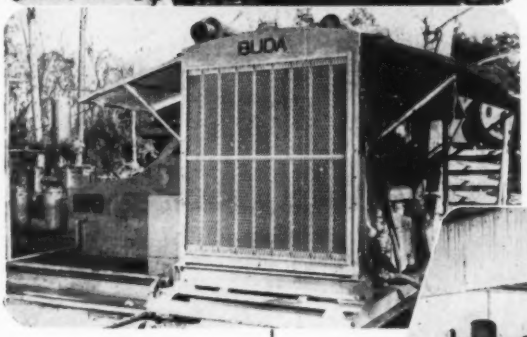
Los Angeles: 2529 Chambers St., Vernon

Western Canada: Lufkin Machine Co. Ltd., Edmonton, Alberta

GASO PUMPS

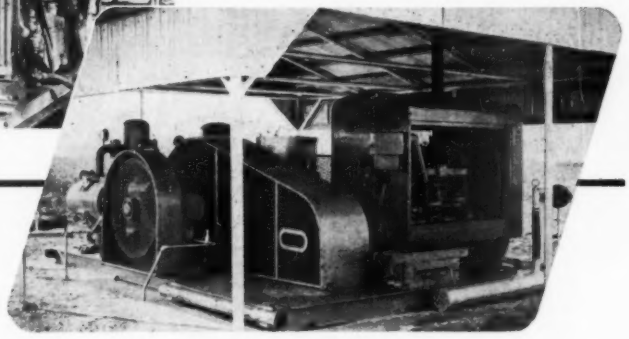
for every oil industry need

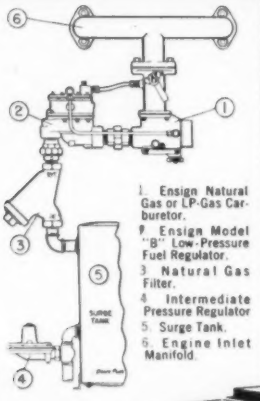
For Power and Economy



Choose a GAS ENGINE with ENSIGN NATURAL GAS CARBURETION

Pictured here is a pair of Buda MO-970's on the drawworks and a single Buda 8PCS-2505 on the mud pump. Another Buda MO-970 is shown below powering a gas compressor. We proudly point to the Ensign Natural Gas Carburetion on these Buda engines.





1. Ensign Natural Gas or LP-Gas Carburetor.
2. Ensign Model "B" Low-Pressure Fuel Regulator.
3. Natural Gas Filter.
4. Intermediate Pressure Regulator
5. Surge Tank.
6. Engine Inlet Manifold.

Gas engine power is dependable, economical and clean Both first cost and maintenance are low. Operators the world over know gas engine simplicity. With Ensign Carburetion the gas engine manufacturer or drilling contractor can send his rigs anywhere—no technically trained operators are required. If natural gas isn't immediately available, you can operate the same engine with LP-Gas with very little modification of the fuel system. When you choose an engine, choose a gas engine.

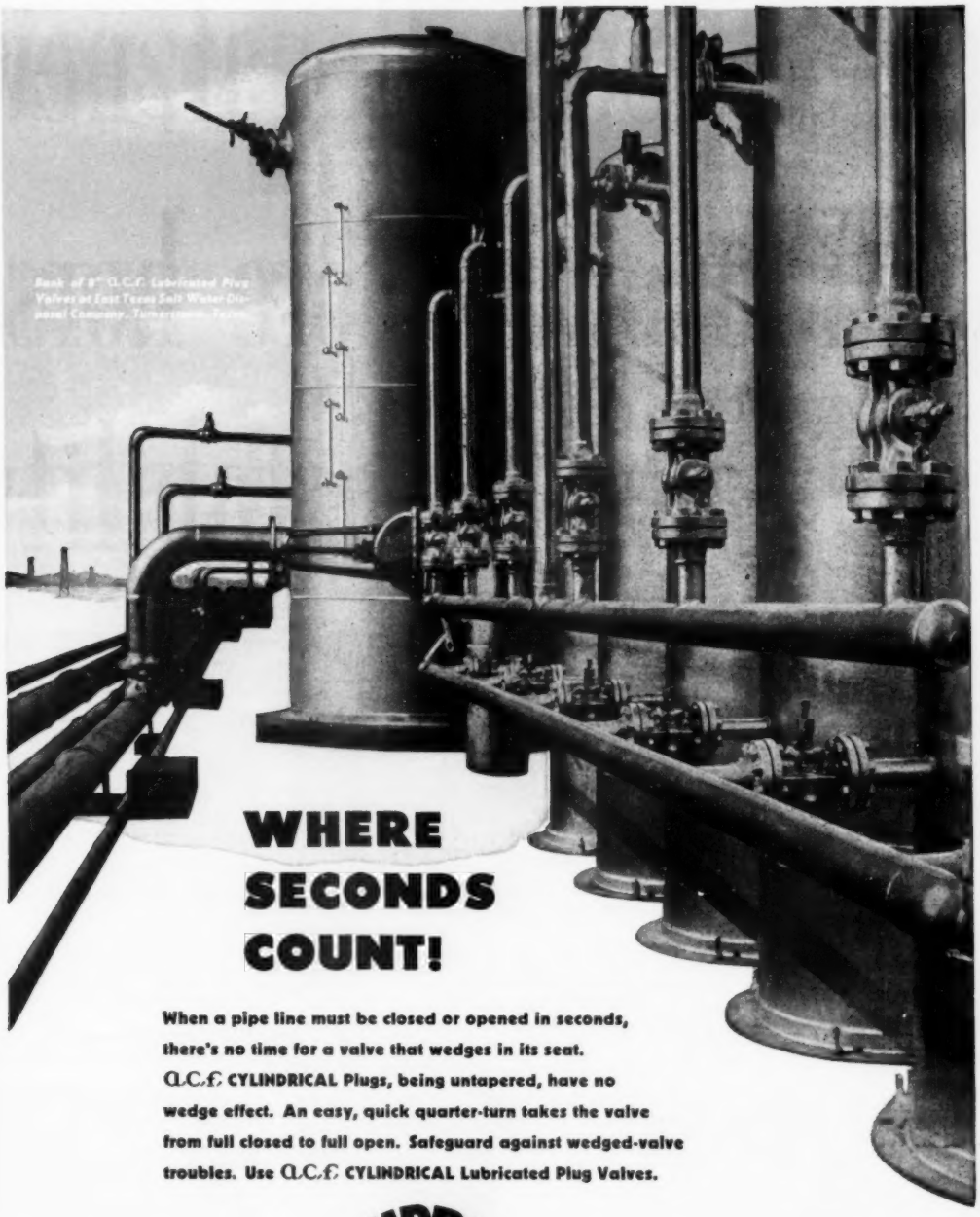
ENSIGN CARBURETOR COMPANY

7010 South Alameda Street
Huntington Park, California

2330 West 58th Street
Chicago 36, Illinois

DEALERS AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

*This advertisement is one of a series featuring popular makes of gas engines in field service.



Bank of 8" A.C.F. Lubricated Plug Valves at East Texas Salt Water Disposal Company, Tumbleweed, Texas

WHERE SECONDS COUNT!

When a pipe line must be closed or opened in seconds, there's no time for a valve that wedges in its seat. a.c.f. CYLINDRICAL Plugs, being untapered, have no wedge effect. An easy, quick quarter-turn takes the valve from full closed to full open. Safeguard against wedged-valve troubles. Use a.c.f. CYLINDRICAL Lubricated Plug Valves.

a.c.f. CYLINDRICAL PLUG VALVES

FULL PIPE AREA

Representatives in 50 Principal Cities

Ask for Catalog 4-OG, American Car and Foundry Company, Valve Division, 1501 East Ferry Ave., Detroit 11, Michigan

Now—more than ever
M=PT
Morse means Power Transmission

Sensational, new transmits more horse allows portability

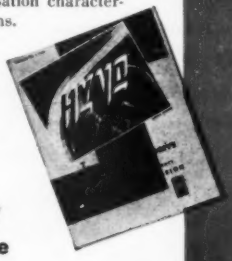
The sensational Morse HY-VO Drive opens the way to transmitting far greater horsepower from smaller, less expensive engines—*without* outboard mounts, bearings, and other cumbersome and expensive accessories. It makes possible new economies and unheard of portability in oil field applications.

The Morse HY-VO Drive transmits much more horsepower per inch of width. A single HY-VO Drive will transmit up to 5000 H.P. at 1200 R.P.M., will run at velocities of up to 6500 F.P.M. and rotative speeds of up to 3600 R.P.M. It gives up to one-third more service life than conventional chain, cuts cost-per-operating-hour up to 50%.

Oil field equipment that once had to be stationary can now be portable, as shown here in just a few of the amazing applications that Morse HY-VO Drives* have taken in stride.

*The Morse HY-VO Drive is an inverted-tooth type chain with controlled pitch variation designed to operate on sprockets with involute teeth. This construction practically eliminates chordal action and linear pulsation characteristic of standard power transmission chains.

Get more complete Morse HY-VO Drive information. Write for Catalog No. C 72-51 today. (Orders for HY-VO Drives must carry priority rating at present time.)



MORSE CHAIN COMPANY
Dept. 191, 7601 Central Avenue
Detroit 8, Michigan

Branch offices serving the petroleum industry:

1312 LaBranch Avenue
P.O. Box 896, Houston, Texas

1571 Harding Avenue
Pasadena, California

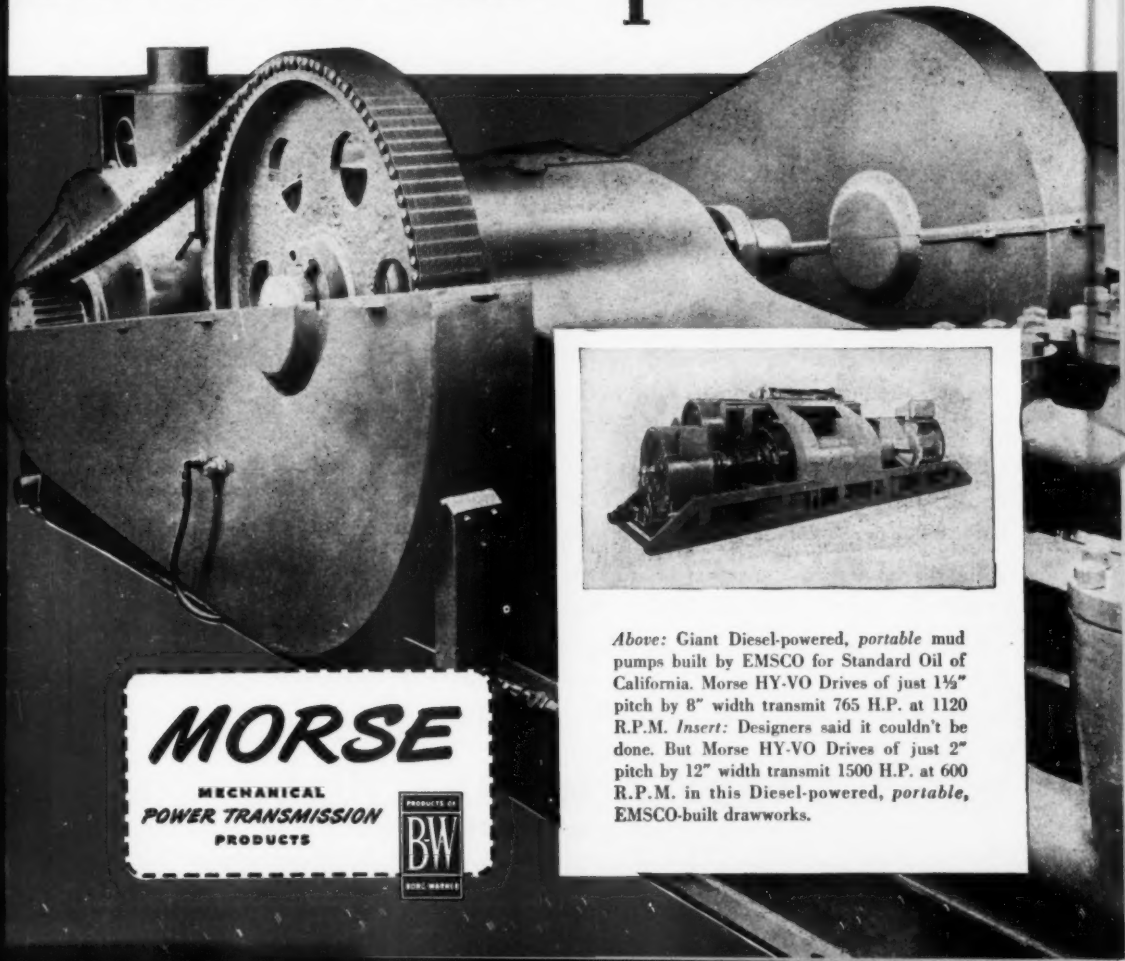
2338 Fairmount
Pittsburgh, Pennsylvania

Other new HY-VO applications

A 1½"-pitch by 6"-wide Morse HY-VO Drive transmits 1200 H.P. at 300 R.P.M. from Diesel engine to 300-kilowatt generator. In background, encased silent chain of 1" pitch by 12" width is required to transmit power to only a 200-kilowatt generator.

A 1½"-pitch by 3"-wide HY-VO Drive on irrigation pump of Joe Summers & Co. in Mission, Texas, transmits 300 H.P. at 514 R.P.M., *with chain velocity of 4600 F.P.M.*, in continuous service twenty-four hours a day during irrigation season.

Morse HY-VO Drive power at higher speeds... never before possible!



Above: Giant Diesel-powered, *portable* mud pumps built by EMSCO for Standard Oil of California. Morse HY-VO Drives of just 1½" pitch by 8" width transmit 765 H.P. at 1120 R.P.M. *Insert:* Designers said it couldn't be done. But Morse HY-VO Drives of just 2" pitch by 12" width transmit 1500 H.P. at 600 R.P.M. in this Diesel-powered, *portable,* EMSCO-built drawworks.

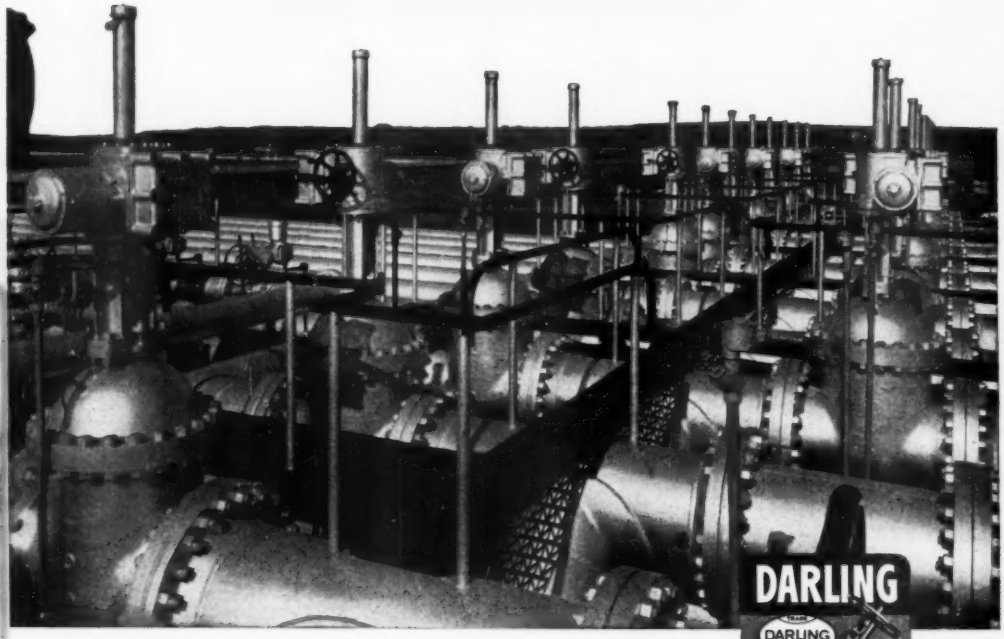
MORSE

MECHANICAL
POWER TRANSMISSION
PRODUCTS

PRODUCTS OF BW BORG-WARNER

RECOMMENDED LINE-UP

for smoother, surer valve performance!



Here's why...

Only in Darling cast steel pipe line gate valves do you have the advantage of Darling's fully revolving double disc parallel seat principle . . . and what a difference!

For example, field experience proves time and again that this feature successfully compensates for valve body distortion. There's tight, *easy* closure—regardless!

And on top of that, disc and seat wear is kept *uniform.* So these key parts just naturally last longer!

Think what these advantages mean in smoother, surer performance . . . in *lower cost* operation and maintenance! But get *all* the facts! Helpful, fully descriptive bulletins are yours for the asking.

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

SEND FOR DATA

Darling Parallel Seat Gate Valves come in a wide range of sizes and types for all gas and oil line requirements. Simply outline your particular service needs or ask for a complete descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

January 18, 1907 OIL INVESTOR'S JOURNAL

BEAUMONT IRON WORKS, INC.

BEAUMONT, TEXAS

Manufacturers of Complete Rotary Drilling Rigs. Standard Rig Irons, Oil Well Machinery, Oil Well and Pipe Line Supplies.

We carry Boilers, Engines and Pumps in Stock both New and Second-Hand

PRODUCING IN 1907

. . . . PRODUCING IN 1951

BIW Rotary Drilling & Production Equipment *for fast, low-cost operation*

Today—enriched by nearly a half century of experience—BIW continues to produce a wide variety of equipment including drawworks, crown and traveling blocks, wellhead assemblies, coring reels and other equipment of high quality design and fabrication.

A specialty product is the Atlas-Hughes non-lubricated valve for Christmas tree and other oilfield uses. For information on all BIW drilling and production equipment, get in touch with your nearest Atlas Engineering Works representative.

exclusive sales agents

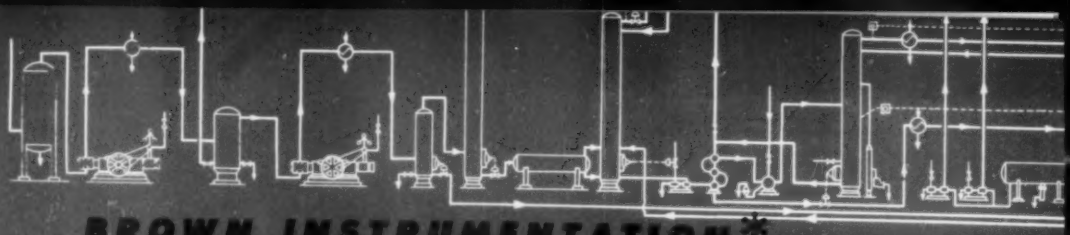
ATLAS ENGINEERING WORKS

Houston and Beaumont, Texas

BEAUMONT

IRON WORKS COMPANY

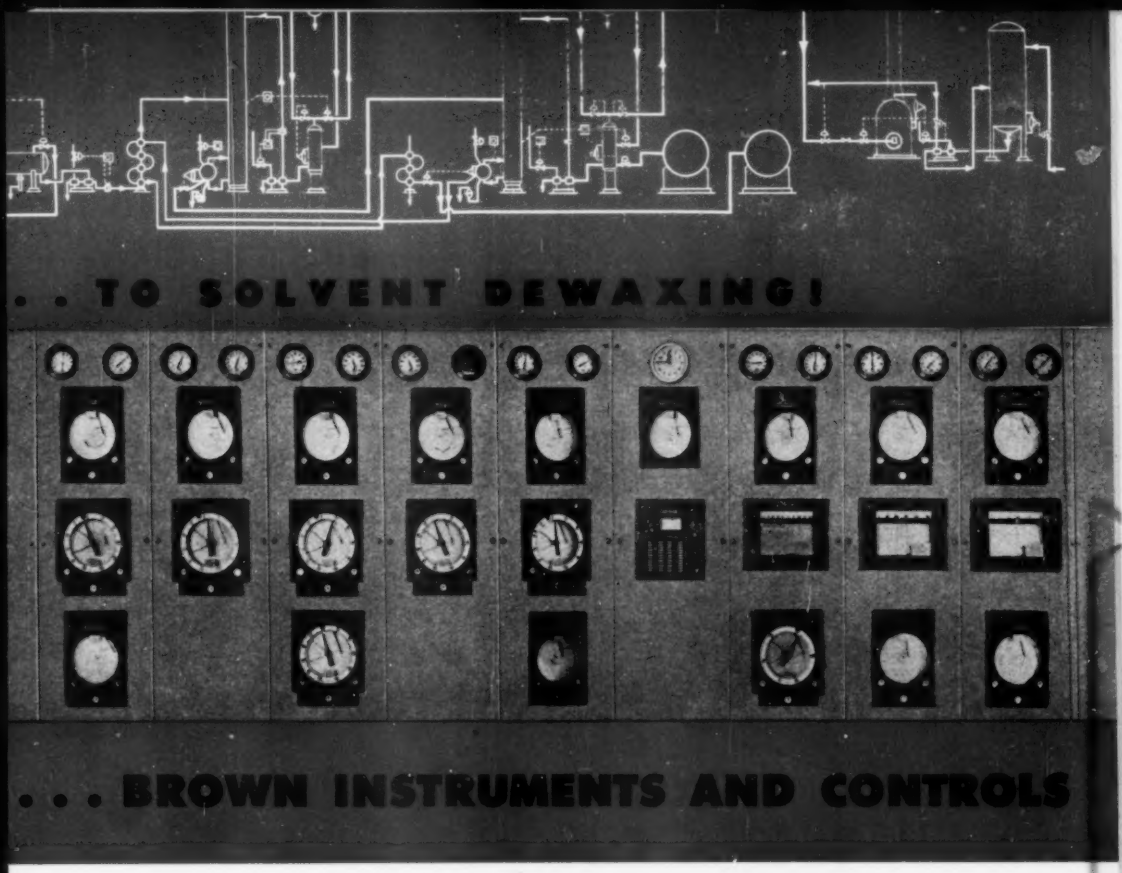
A Subsidiary of American Locomotive Company



BROWN INSTRUMENTATION* IS THE MODERN APPROACH . . .

MODERN SOLVENT DEWAXING PLANT DESIGNED FOR PROCESS SIMPLIFICATION

. . . relies on .



✻ ***BROWN INSTRUMENTATION*** . . . is patterned to the exact requirements of individual plants and processes . . . is the result of engineering and application know-how, with one responsibility from sensing elements to control valves . . . is backed by a nation-wide field engineering and service organization.

SOCONY-VACUUM'S modern solvent dewaxing unit at the Paulsboro, N. J. plant is evidence that the Flying Red Horse is keeping abreast of the latest refining advances.

This modern unit . . . recently constructed by E. B. Badger . . . attains a new high in operating ease, through modern instrumentation.

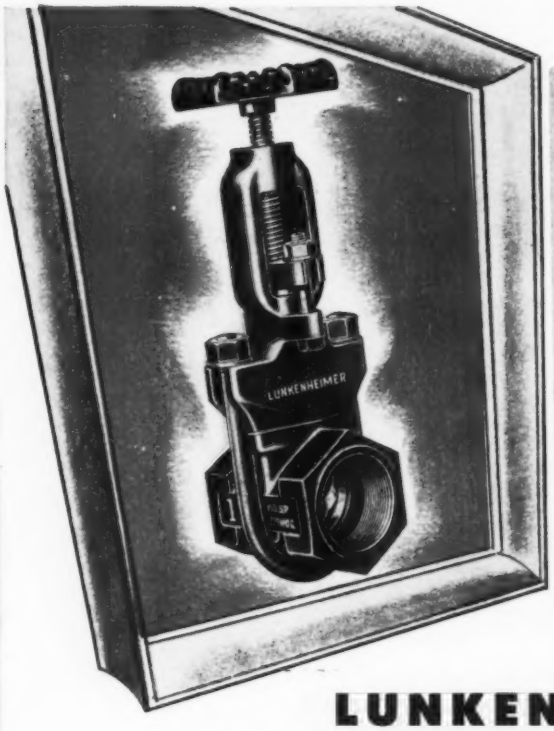
The all-Brown panelboard includes temperature, vacuum, level, rate of flow and ratio flow controllers . . . as well as a variety of recording and indicating instruments . . . for simplified and economical operation of each step in the process.

When looking for recording and controlling instruments for your solvent dewaxing operation, or *any refining operation—consider first:*

- ✻ *The Brown know-how developed through many years of application experience in the industry.*
- ✻ *The completeness of the Brown modern approach — recorders, controllers, panelboards, valves, and all accessories.*

Call in our local engineer for a detailed discussion of your process requirements . . . he is as near as your phone. Offices in more than 80 principal cities of the United States, Canada and throughout the world. MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4488 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
Brown Instruments



The Famous "Original" That Has Never Been Equalled

LUNKENHEIMER King Clip Valve

Constantly Improved for More than Half A Century

The original "clip" valve was developed by Lunkenheimer in 1893. It's been imitated many times . . . but the know-how that created it and improved it through the years has kept Lunkenheimer's King Clip the prominent favorite. Here are a few of the reasons for its popularity . . .

- **Bronze stem-thread bushing is cast in the bonnet and machined with it. There's no stem binding or undue thread wear.**
- **Large, unobstructed drain channels permit free passage of fluids that tend to clog, congeal or freeze up.**
- **Bronze rolled-in seat rings provide bronze-to-bronze contact with the disc. Prevents corrosion. Results in trouble-free, low-cost service.**
- **The stuffing box can be repacked in seconds while the valve is wide open and under pressure.**
- **A gentle tug with a wrench brings the hexagon head gland out. No more prying "frozen" glands.**

Get the *first* and *best*—Lunkenheimer's King Clip—constantly improved for nearly 60 years. Ask your distributor for more information.

And write for Circular 561, describing the complete line in detail. Address: The Lunkenheimer Company, Box 360F, Cincinnati 14, Ohio.

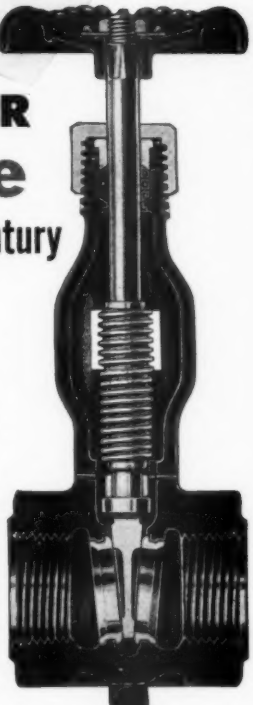


FIG. 1640

IRON • STEEL • BRONZE

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-151-39

A gearturbine built to save...

Three ways

The Westinghouse Gearturbine costs less to buy . . . less to install . . . and less to maintain. Wrapped up in a single package is a compact, rugged and reliable speed-reduction unit solidly coupled to a Type E turbine. It's the ideal combination for ratings up to 500 hp and output speeds commonly found in single-ended applications.

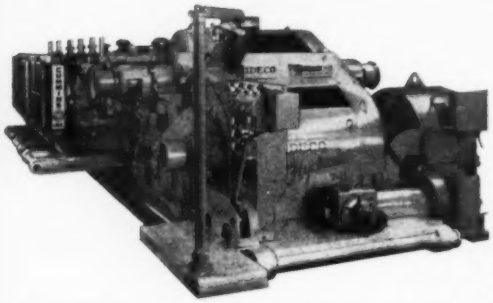
Here's economy made possible by a standardized design that cuts manufacturing costs . . . avoids costly specials . . . saves space . . . and simplifies maintenance. And you get the maximum flexibility possible . . . any combination of three turbine wheel sizes, three gears and three types of governor can be used according to your needs.

Other plus features are . . . solid coupling of turbine shaft to pinion shaft; single-helical gearing; forced circulation, filtered oil; and 3-point support for easy mounting and leveling.

J-50521

GET THE FULL STORY. A newly available booklet, B-4346, clearly explains the applications, refinements and advantages of Westinghouse Gearturbines. Ask your nearby Westinghouse representative for your copy, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

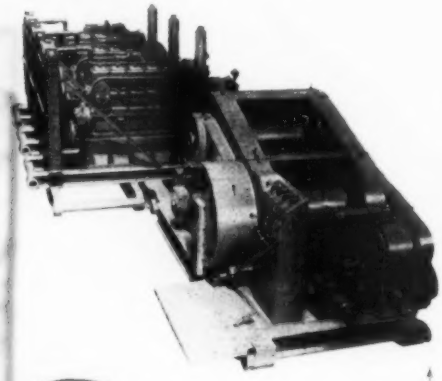
YOU CAN BE SURE.. IF IT'S
Westinghouse
TYPE E Turbines



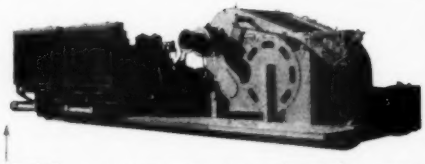
The *Hydrair* 7-11 . . . a torque converter equipped rig recommended for drilling to depths of 10,500 ft. with 4½" drill pipe when powered by engines developing a total of 1050 H.P.

IDECO Hydrair RIGS

All Hydrair Rigs are available in single and double drum models.

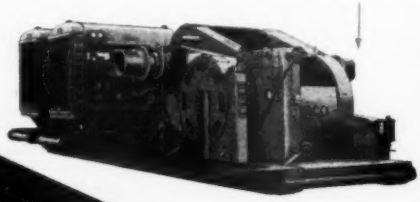


NEW Available in torque converter and mechanical models H and M 750 series drilling rigs are recommended for drilling to 8,000 ft. with 4½" drill pipe when powered with two or three engines developing a total of 700 to 750 H.P.



The *Hydrair* H-525 . . . a torque converter equipped rig recommended for drilling to depths of 7,000 ft. with 4½" drill pipe when powered by two or three engines having a combined output of 500 to 600 H.P.

The *Hydrair* H-40 . . . a torque converter equipped rig recommended for drilling to depths of 6,500 ft. with 4½" drill pipe when powered with one or two engines developing a total of 400 H.P.



FULL TORQUE CONVERTER DRIVES
AIR CONTROLS • AIR CLUTCHES

IDECO Hydrair rigs have been designed to obtain the maximum efficiency from hydraulic torque converter drives...air clutches...fingertip air controls.

A Division of Dresser Equipment Co.

HEADQUARTERS: Dallas, Texas.
PLANTS: Beaumont, Texas; Columbus and Delaware, Ohio; Torrance, California.
EXPORT OFFICES: Dallas, Texas; New York City; Torrance, California; Argentina—Buenos Aires; Brazil—Rio de Janeiro; Colombia—Barranquilla; England—London; France—Paris; Italy—Somma Lombardo, Varese; Turkey—Ankara, Istanbul; Venezuela—Caracas, Maracaibo.
CALIFORNIA OILFIELD SALES: IDECO—Torrance, California.
WESTERN CANADIAN DISTRIBUTOR: Dominion Oilfields Supply Co., Ltd., Calgary, Alta.

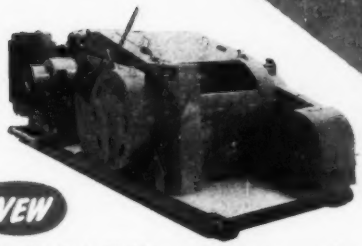
IDECO HYDRAIR RIGS ARE AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE

WORLD'S MOST COMPLETE LINE OF FIELD-PROVED TORQUE CONVERTER RIGS FOR DRILLING WORKOVER AND SERVICING OPERATIONS

Only IDECO offers a complete line of *field-proved* rigs designed to obtain the maximum efficiency from hydraulic torque converter drives combined with air clutches and fingertip air controls. *That's why* . . . whatever next drill for oil the trend is to the *Hydrair* line. This definite preference by drilling contractors has been won in the field by a record of fast, "maintenance free" operation . . . in the business office by a record of increased profits per contract. Compare the *Hydrair* line with competitive equipment . . . examine its "easy-to-service" design and many safety features. There is a *Hydrair* rig designed to fill your most exacting drilling or service requirement. Get all the facts . . . send for bulletin CC-51 today.

IDECO

ONE OF THE DRESSER INDUSTRIES



NEW

The *Hydrair* H-35 . . . a torque converter equipped rig for drilling to 5,000 ft. with 4½" drill pipe when powered by an engine developing a total of 350 H.P.

The H-35 is available in three models. H-35-S . . . a single drum drilling unit for wire line servicing to 13,500 ft. H-35-D . . . a double drum drilling unit for wire line servicing to a depth of 11,500 ft. H-35-DD . . . a double drum drilling unit for wire line servicing to a depth of 16,150 ft.

The *Hydrair* H-25 . . . a torque converter equipped rig recommended for drilling to 3,300 ft. with 4½" drill pipe and wire line servicing to 9,000 ft. when powered with an engine developing a total of 200 H.P.

The *Hydrair* H-30 is a torque converter equipped rig recommended for drilling to 4,500 ft. with 4½" drill pipe and wire line servicing to 10,000 ft. when powered with an engine developing a total of 310 H.P.

The *Hydrair* H-38 . . . a torque converter equipped rig recommended for workover to 6,000 ft. with 4½" drill pipe and for wire line servicing to 16,000 ft. when powered by an engine developing a total of 400 H.P.

The *Hydrair* H-20 . . . a torque converter equipped rig recommended for workover to 2,500 ft. with 4½" drill pipe, 4,900 ft. with 3" tubing, and for wire line servicing to 7,500 ft. when equipped with an engine developing a total of 200 H.P.

10,000 HOURS

CONTINUOUS SERVICE "ON STREAM"

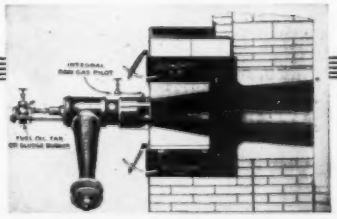
...not unusual for

THE NATIONAL AIROIL

TANDEM COMBUSTION UNIT

Ten thousand hours without shutdown is not "Overtime" for process oil heaters fired by the **National Airoil Tandem Combustion System** firing dirty, wet refinery gas; uncut asphalt; refinery fuel oils . . . **hours are long . . . profits are high . . . you** will realize high profits from **your** heaters when **Tandem Combustion Units** are specified.

Detailed information sent upon request on your business letterhead.



CHEMICAL-PETROLEUM DIVISION

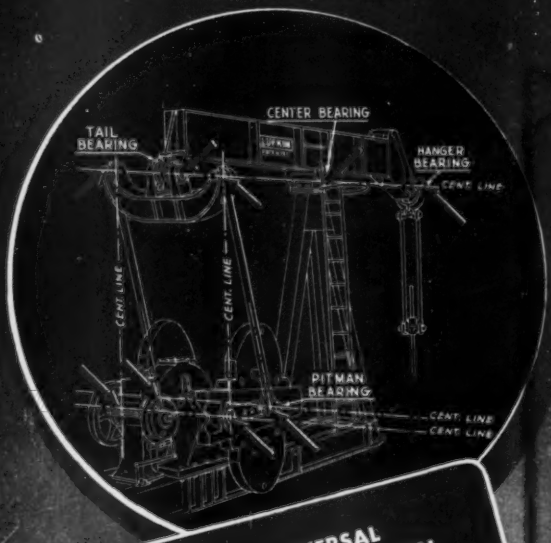
NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: 1236 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.
Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

Lufkin

CENTERLINE CONSTRUCTION GIVES STRENGTH... ALIGNMENT



LUFKIN UNIVERSAL CENTERLINE CONSTRUCTION

places the walking beam bearings in a straight horizontal line plane with resulting minimum stress in the beam. This also has a tendency to smooth out the pumping cycle and eliminate beam twist. Inherently the Lufkin Beam has a very high load carrying capacity, being made of wide flange beam sections with stiffeners for added strength. The walking beam is mounted on a bronze bushed, oil bath, center iron.

LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming, Great Bend, Kansas.

Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD. 14321 108th Avenue, Edmonton, Alberta, Canada.

LUFKIN PUMPING UNITS

LUFKIN-COOPER-BESSEMER ENGINES

LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

You can count on this sign...

for Years-Ahead engineering

The Lummus symbol stands for a group of designing engineers and constructors who make it their business to *plan ahead*—an ability which keeps them always abreast of the pace and often stamps them pacesetters.

That's why you found Lummus at the forefront in the vast synthetic rubber program. It's what made the company logical pioneers in the aviation gasoline field, with fourteen complete plants to its credit. It's what keeps Lummus in the van, wherever or however crude oil is refined.

By the same token, count on Lummus people again in the hurried and harried times ahead. Depend upon them for specialized planning that brings expanded needs into sharp focus. Rely on their record of skillful design, sound engineering, competent construction, and on schedule delivery.

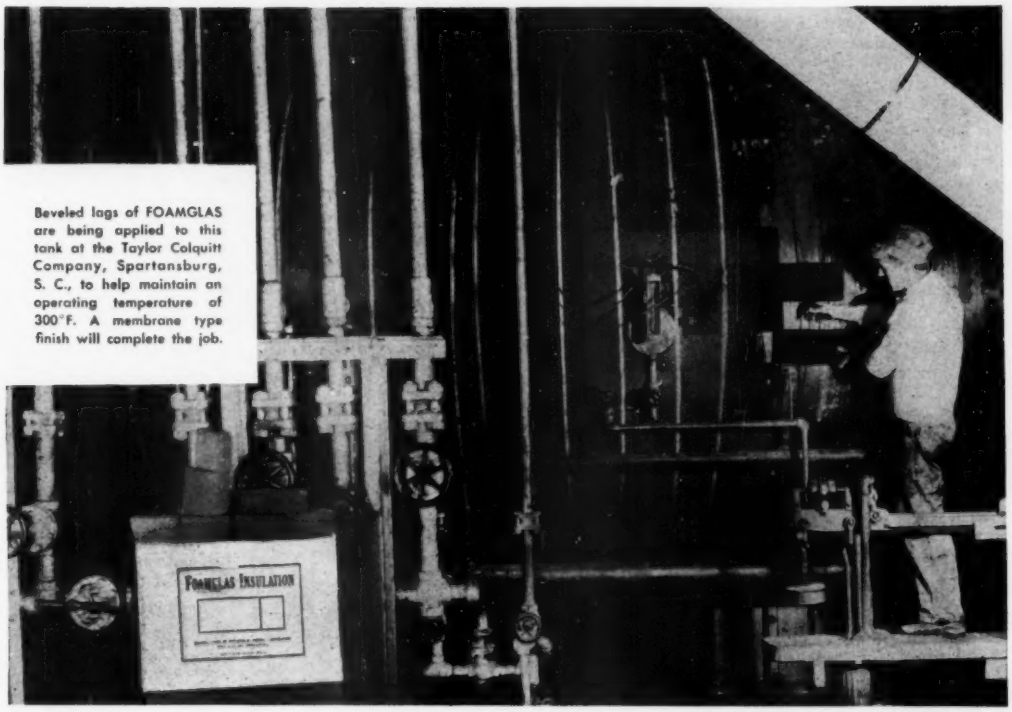
In whatever direction the upward trend of demand occurs—total crude capacity, catalytic cracking facilities, plants for making high quality aviation gasoline, petroleum chemical units—you'll find Lummus well able to fulfill the difficult requirements imposed by years-ahead engineering.

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

CHICAGO • HOUSTON • LONDON • CARACAS • PARIS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES



Beveled lags of FOAMGLAS are being applied to this tank at the Taylor Colquitt Company, Spartansburg, S. C., to help maintain an operating temperature of 300°F. A membrane type finish will complete the job.

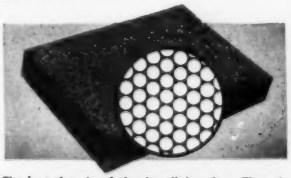
KEEPING HOT STUFF HOT! FOAMGLAS

the cellular glass insulation

This unique material has proved its ability to insulate tanks and towers, valves and piping, heat exchangers, evaporators and other processing equipment, most effectively and economically.

FOAMGLAS has excellent insulation properties and *retains* them, unchanged, year after year. It has unusually high resistance to moisture, chemicals, and other elements that cause most insulating materials to deteriorate. It assures freedom from costly repairs and replacements. Light weight, rigid and strong, FOAMGLAS is ideal for insulating indoor and outdoor, hot and cold piping and process equipment.

Start today to learn more about FOAMGLAS. Its wide acceptance is due to its basic insulating value, adaptability and durability that insures long, trouble free service. Send for a sample and a free copy of our latest booklet.



The *best* glass insulation is cellular glass. The *only* cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, vermin-proof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.

PITTSBURGH CORNING CORPORATION
PITTSBURGH 22, PA.

PITTSBURGH PC CORNING ®

FOAMGLAS® *the cellular glass insulation*

When you insulate with FOAMGLAS — the insulation lasts.

Pittsburgh Corning Corporation
Dept. DD-81, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping & Process Equipment.

Name.....

Address.....

City.....State.....

The photo above is another of a series of factual stories of how the Petroleum Industry is benefited by LOW COST Purchased Electric Power.

Automatic Control releases manpower and cuts payroll costs. *PEP works 24 hours a day or operates on any fractional time schedule — this means you pay only for power used. Now is the time — in '51 — to get the job done with LOW COST Purchased Electric Power!

*PEP — Purchased Electric Power

Petroleum Electric Power Association

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS

Coming soon

. . . the West Coast's first plant for the production of Coal-Tar Enamels

● At Fontana, California, Koppers is building a new, modern plant for the production of Bitumastic® Enamels, the Coal-Tar Base Coatings which have been famous for nearly a century for protecting underground and underwater metal surfaces from corrosion. This plant, which will also produce Koppers Roofing Pitch, will be the first such plant to be located west of the Rocky Mountains. From it, Koppers will be able to provide improved service to West Coast users of Bitumastic Enamels.

Bitumastic Enamels are the tough coatings that are used to protect buried oil and gas pipe lines against severe corrosive elements. Large-diameter steel water pipe lines also are protected, both inside and out, by Bitumastic Enamel. On the inside of the pipe, this enamel is applied in a smooth lining that keeps flow capacity high and reduces pumping costs.

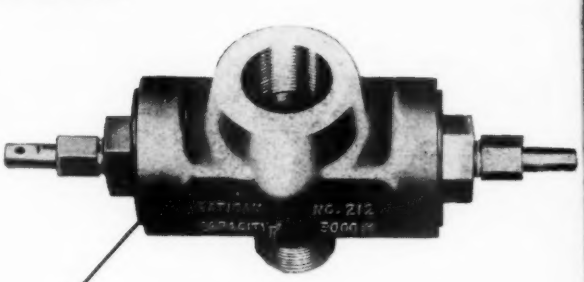
Processed from a base of Coal-Tar Pitch, Bitumastic Enamels are impervious to moisture and are chemically resistant to soil elements. They make a tight bond with pipe and other metal surfaces, do not disintegrate with age, and maintain continuously high electrical resistance.

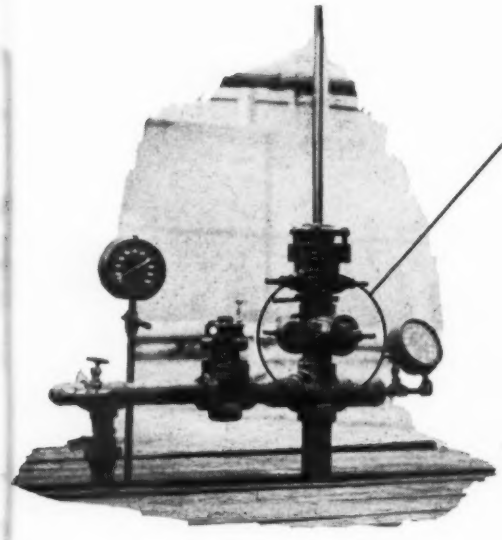
For information on delivery of Bitumastic Enamels . . . on the West Coast or elsewhere in the United States . . . we invite you to get in touch with us.

KOPPERS **BITUMASTIC** ENAMELS
REG. U.S. PAT. OFF.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 804T, Pittsburgh 19, Pa.

Years Of
STEADY, RELIABLE SERVICE
Help Keep Production Costs
TO MINIMUM . . .
PROFITS UP!





RATIGAN
NO. 212
BLOWOUT PREVENTER

Engineered For Maximum Safety and Efficiency On Your Producing Well

Continual service of Ratigan No. 212 Blowout Preventers provides operators with higher margins of profit, year after year. It is a simple unit that involves no special tools or equipment for service and maintenance. Except for periodic inspection, the No. 212 requires very little maintenance, with the exception of changing the rubbers which is easily and quickly accomplished by unscrewing the plugs at each end. When the plugs are unscrewed, the old rubbers are readily accessible for replacement.

The No. 212 is an extremely lightweight unit, weighing only 41 pounds, yet with a capacity of 3000 lbs., far more than is required under normal service conditions.

The complete assembly also can be used for swabbing or running rods in wells that head, or flow, in the course of operations. Two units of the same size, with a nipple of any required length in between, make a most efficient swabbing device.

The No. 212 is manufactured in 2", 2½", and 3" sizes. The 2" and 2½" sizes are supplied both plain and upset and can be furnished either double female or male and female. The 3" size is supplied in male and female only. However, the male connection easily can be converted to female by installing a 3" collar, thus making a double female unit.

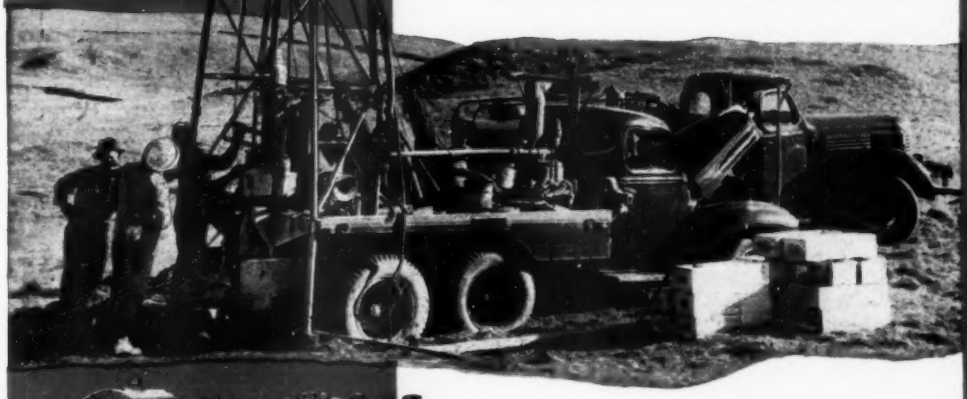
All Ratigan Products Are Illustrated In The Latest Edition of The Composite Catalog

J. P. RATIGAN, Inc.

1213 Santa Fe Avenue, Los Angeles 21, California

Export: National Supply Export Corporation, 600 5th Avenue, New York 20, N. Y.

RATIGAN PRODUCTS ARE DISTRIBUTED THROUGH LEADING SUPPLY STORES



pick seismograph pumps as you pick your crews— and you'll choose GARDNER-DENVER

Every man on your seismograph crew must know his job and do it well. And every piece of equipment on your rig must operate dependably when you're out in the field. That's why you'll find Gardner-Denver FX Seismograph Pumps are the world's most popular pumps for geophysical and exploration service.

Note these famous Gardner-Denver features:

One-piece GarDurloy liquid end — for absolute safety at 900 pounds working pressure.

One-piece alloy iron main frame — maintains perfect alignment — fully enclosed against dust and slush.

Timken tapered roller main bearings — adjustable when necessary.

Eccentric construction — for a stronger main shaft and low bearing pressures.

Solid type connecting rod — no bolts to loosen or fail.

Write us today for additional information.

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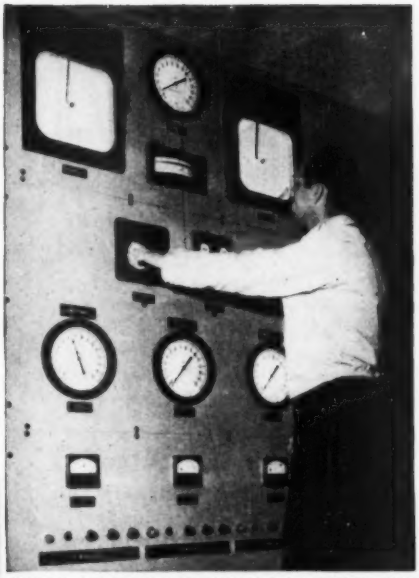
Republic Supply Co., (Of Calif.), 2600 S. Eastland Ave.,
Los Angeles, Calif.

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS



BRISTOL CONTROL INSTRUMENTS IN TEJON PUMP STATION

BRISTOL INSTRUMENTS HELP RICHFIELD KEEP TEJON PUMP STATION OPERATING AT TOP EFFICIENCY.....

Bristol is proud to have been selected by the Richfield Oil Corporation to supply instruments for its new 112-mile pipeline from the Cuyama Oil Field to the Watson Refinery at Wilmington (Calif.).

Completely equipped with Bristol Control Instruments, the Tejon pump station is outstanding for efficiency and ease of operation.

BRISTOL INSTRUMENTS:

- Automatically control and record the flow rate of the oil in the pipeline.
- Automatically control the temperature of the lubricating oil and jacket cooling water in the three Diesels.
- Record line discharge pressure.
- Indicate line suction, booster pump pressures, and pipeline temperature.

These instruments are located on the central control panel shown to the left. They simplify operation of the station.

Bristol Instruments are used the world over in oil fields, oil refineries, and on oil and gas pipe lines. They are backed by over 60 years of experience in building precision instruments.

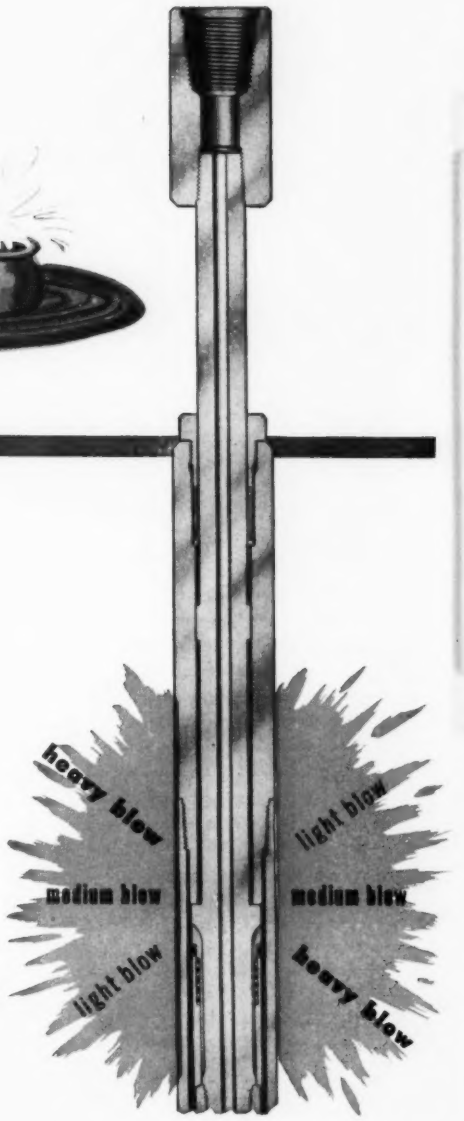
Write us for literature on Bristol control instruments. THE BRISTOL COMPANY, 120 Bristol Road, Waterbury 20, Conn.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

The right jar for the job at hand

Jarring Jerry



THE JOHNSTON-SUTLIFF HYDRAULIC JAR

A Jar that hits any desired blow, at any time, to meet any condition—without pulling out of the hole.

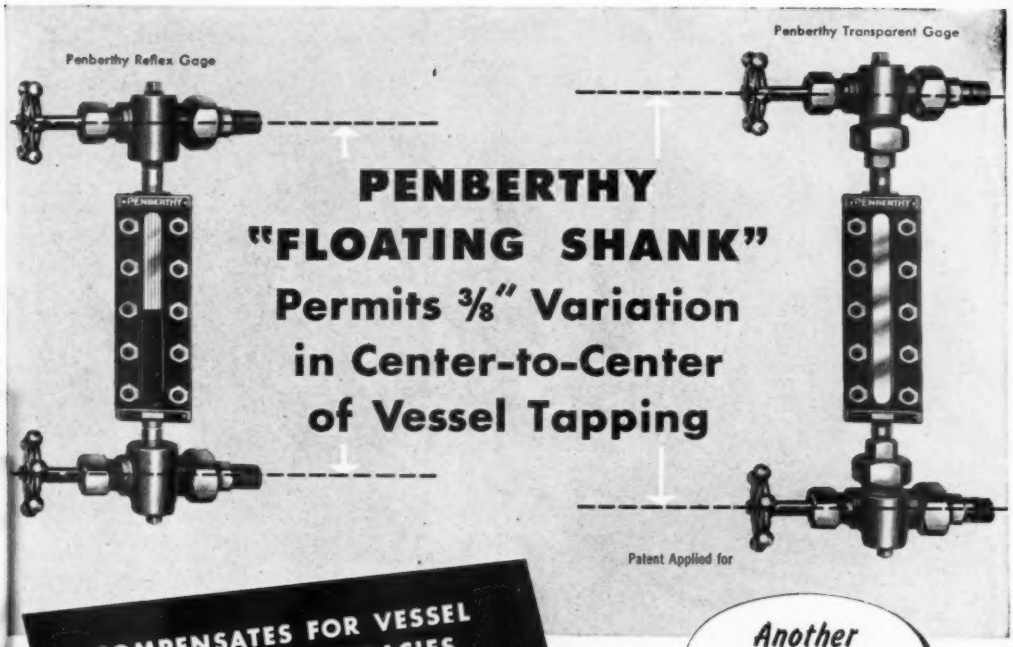
Write For Descriptive Literature!

JOHNSTON

SHOOT TEST

M. O. JOHNSTON OIL FIELD SERVICE CORPORATION
3035 Andrita Street — Los Angeles 65, California
"Servicing California & Rocky Mountains"

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION
3035 Andrita Street — Los Angeles 65, California
"Exclusive Export Sales"



COMPENSATES FOR VESSEL TAPPING INACCURACIES

•

SAVES INSTALLATION TIME

•

REDUCES GAGE STRESSES

Another **PENBERTHY** *First*

An important new feature now available on all Penberthy drop forged steel gage valves is the "floating shank" . . . an improvement that has money-saving advantages to many users of liquid level and water gages.

The "floating shank" compensates for inaccuracies in the center-to-center distance of the tapped holes in the vessel on which the gage is mounted. The variation can be as much as 3/8". It provides a mounting flexibility not elsewhere obtainable . . . it saves time during installation of the gage . . . it eliminates stresses that are often induced during mounting.

The Penberthy "Floating Shank" can be had at slight additional cost . . . specify it on your next order for Penberthy drop forged steel (or alloy) gage valves.

4449

PENBERTHY INJECTOR COMPANY

DIVISION OF THE BUFFALO-ECLIPSE CORPORATION

Detroit 2, Michigan

Established 1886 *Canadian Plant, Windsor, Ontario*

OTHER PENBERTHY PRODUCTS

PENBERTHY CYCLING JET PUMPS

Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.

PENBERTHY EXPLOSION-PROOF SUMP PUMPS

Motor and switch totally enclosed. Underwriter approved for Class 1, Group D, and Class 2, Groups E, F and G hazardous location. Made of copper and bronze throughout. Ask for Bulletin 4929.

PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Ask for Bulletin 5080.

They Say—

Pipe Complaint

"If we are correctly informed there is more gray-market pipe available today than before the PAD program was instituted. That alone is conclusive evidence that something is fundamentally and basically wrong with the present program and formula for distribution.

"We believe that the officials of PAD are in the position to recognize the factors contributing to the inequities and ineffectiveness of the existing program and, likewise, to institute immediately such measures and directives as are necessary to correct this very critical situation in which course you can be assured of our wholehearted support."

E. I. Thompson, executive vice president, Texas Independent Producers and Royalty Owners Association, in a telegram to Deputy PAD Administrator Bruce K. Brown.

Belated Bouquet

Sir:

Your Golden Anniversary Number has been greatly appreciated here, and particularly in the C.B.M.P.E. and prized as a mosaic of the petroleum industry during 50 years. As a close and constant reader and user of the journalistic achievements which you have provided over my own period of service to the industry, covering 40 years, you will accept, I feel sure, my tribute to the comprehensiveness of the collected news and records which you have consistently published. Like the New York Times that appears daily with "all that's fit to print" you have given to the industry "all that's current."

T. L. Bonstow, technical adviser,
Council of British Manufacturers
of Petroleum Equipment,
London.

Natural Gas and Beer

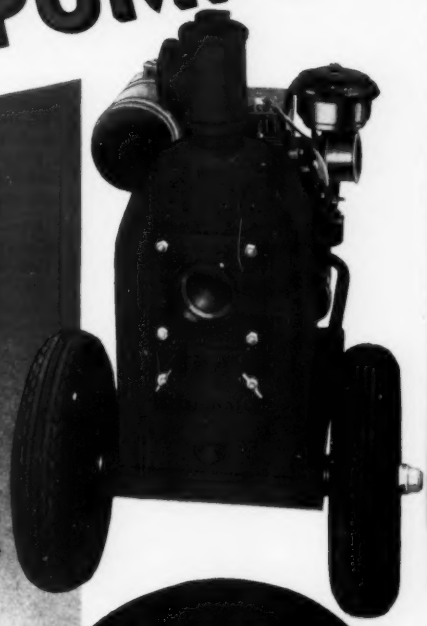
"The Milwaukee Journal fell into a fit of swooning the other day when the Federal Power Commission decided that it has no jurisdiction over well-head rates charged for natural gas carried in interstate pipe lines.

"This was a dire blow to the natural gas consumers of Milwaukee, said the Journal. These consumers would have to pay higher rates for natural gas. A black deed had been done, with innocent Milwaukee the groaning victim.

"Wholly ignored by this befuddled publication is the fact that the producers of natural gas in areas where it exists have rights as well as the citizens of Milwaukee.

"The price at the well head should

best for the job
• SELF PRIMING
• CENTRIFUGAL
McGOWAN PUMPS



These rugged McGOWAN all welded fuel pumps are lighter, yet stronger, more durable than any you've ever seen. Now in operation in Oil Fields throughout the world. They feature — automatic priming • non-clogging impeller hardened wear plates • large access plates • tested and trouble free shaft seals.

SINCE 1852 McGOWAN PUMPS

Long life service means extra economy! McGowan Pumps have been serving the Industry since 1852. See your Supply Co. or write today for catalog sheets, complete information.

McGOWAN PUMP DIV., Leyman Mfg. Corp.
58 Central Ave., Cincinnati 2, Ohio
Please send without obligation data on McGowan self priming centrifugal pumps.
COMPANY_____
NAME_____
ADDRESS_____

New, Fast, Positive Fire Killer...

DRY CHEMICAL **WHEELED PORTABLE FIRE EXTINGUISHER**

Experienced engineering develops new, highly efficient 150-pound capacity dry chemical type wheeled portable fire extinguisher . . . has exclusive design that assures you of lasting, foolproof fire protection.

This new fire killer is easy to operate, compact, well-balanced and offers extensive maneuverability indoors or outdoors. Does a highly effective job on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials . . . granted unconditional B, C rating by the Underwriters' Laboratories, Inc.

Exclusive design renders constant free-flowing dry chemical . . . fire extinguisher is partially inverted for wheeling, then fully inverted at fire scene, which changes the position of the dry chemical in the tank and thereby provides mechanical breakage. This outstanding mechanical breakage feature, plus a continuous nitrogen pressured agitation or fluffing, together with a skillfully blended free-flowing dry chemical, guarantees a faster, more effective and complete discharge.

Rechargeable on-the-scene . . . no special tools needed . . . C-O-TWO Dry Chemical for recharging packaged in handy 50-pound size, moisture-proof containers . . . spare nitrogen pressure cylinders readily available.

Act now for complete free information on this newest contribution to modern fire fighting. Remember . . . you can't put fire off . . . fire doesn't wait. Get the facts today!

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada
Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

be a fair price, no matter who fixes it. And, in any event, the wellhead price is such a small part of what the ultimate consumer in Milwaukee pays, that the Journal, in its frothing, is being ridiculous.

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Editorial in the Shreveport Times.

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Editorial in the Fort Worth Star-Telegram.

American Help Wanted

"In case of the probable refusal of English experts to serve in the National Iranian Oil Co., the American companies can remove any stoppage in this great industry, which could certainly be damaging to the Western World, by their expert help and by putting at our disposal an adequate number of technical experts, and by giving help in the transportation of Iranian oil to former purchasers. The American Government can also encourage American companies in that respect."

Prime Minister Mohammed Mossadegh of Iran in a radiotelegraph interview published by U. S. News & World Report.

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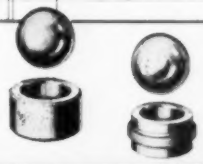
PRODUCTION ECONOMICS...

by Pacific PUMPS INC.

	QUESTION		ANSWER
Q	*Why is oil at the bottom of the well like money in a safe deposit box?*	A	Because it is a LIQUID ASSET IN DEAD STORAGE WITHOUT EARNING POWER.
Q	*Can this condition be changed?*	A	Yes — both can be activated and given earning power.
Q	*How can they be activated?*	A	Draw some of the money from the safe deposit box — purchase and install a Pacific Oil Well Plunger Pump in the well — pump the oil to the surface. MONEY IN CIRCULATION — OIL IN CIRCULATION — BOTH WITH POWER TO EARN.
Q	*Why purchase and install Pacific Oil Well Plunger Pumps?*	A	Because only Pacific gives you the EXCLUSIVE MOLOY® LINERS with the strength, toughness, hardness, combined with greater resistance to temperature, corrosion and abrasion essential for long, economical life.



Plungers — Chrome-Plated then Pacilited for extra wear life.

Valves and Seats — To fit well conditions.

Extra Heavy Seats — Resist hammering of ball with less chance of distortion.

PACIFIC *Precision Built* PUMPS

DW-6

Pacific Pumps inc.

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

New, Fast, Positive Fire Killer...

DRY CHEMICAL **WHEELED PORTABLE FIRE EXTINGUISHER**

Experienced engineering develops new, highly efficient 150-pound capacity dry chemical type wheeled portable fire extinguisher . . . has exclusive design that assures you of lasting, foolproof fire protection.

This new fire killer is easy to operate, compact, well-balanced and offers extensive maneuverability indoors or outdoors. Does a highly effective job on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials . . . granted unconditional B, C rating by the Underwriters' Laboratories, Inc.

Exclusive design renders constant free-flowing dry chemical . . . fire extinguisher is partially inverted for wheeling, then fully inverted at fire scene, which changes the position of the dry chemical in the tank and thereby provides mechanical breakage. This outstanding mechanical breakage feature, plus a continuous nitrogen pressured agitation or fluffing, together with a skillfully blended free-flowing dry chemical, guarantees a faster, more effective and complete discharge.

Rechargeable on-the-scene . . . no special tools needed . . . C-O-TWO Dry Chemical for recharging packaged in handy 50-pound size, moisture-proof containers . . . spare nitrogen pressure cylinders readily available.

Act now for complete free information on this newest contribution to modern fire fighting. Remember . . . you can't put fire off . . . fire doesn't wait. Get the facts today!

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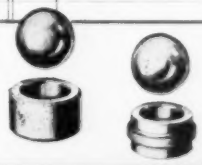

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Valves and Seats —To fit well conditions.

Extra Heavy Seats — Resist hammering of ball with less chance of distortion.

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DW-6

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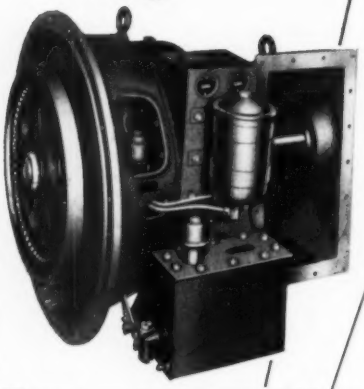
HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

always the right connection



between driving and driven units . . .

Wherever you find horsepower at work, you will find Twin Disc Clutches and Hydraulic Drives.

That's because Twin Disc offers *standard* units for every kind of application in the industrial field, from split-second work cycle operations to 1000 hp tugs-of-war between prime movers and mother nature.

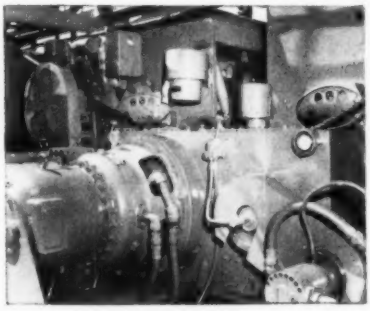
Thirty-three years of working with hundreds of leading equipment manufacturers have proved that, no matter the problem, Twin Disc can help provide the answer.

And an answer that is impartial, for not only does Twin Disc offer a complete line of friction clutches, it offers a complete line of industrial fluid drives as well.

That's why for the *right connection between driving and driven units*, always specify Twin Disc.

for example

Twin Disc Hydraulic Torque Converters are available for any make of engine commonly employed in the oil fields. This unit is employed on an Ideco rig on which two engines drive through a single converter. Twin Disc is the only Hydraulic Torque Converter available in a complete range of models to handle from 40 to 1,000 hp.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

Statler, Book-Cadillac, and Detroit-Leland, Detroit, October 15-19.

Institute of Gas Technology, annual meeting, Chicago, October 18.

American Chemical Society and Southern Association of Science and Industry, Southwide Chemical Conference, Wilson Dam, Ala., October 18-20.

National Association of Corrosion Engineers, South Central Region, annual meeting, Corpus Christi, Tex., October 18-20.

American Association of Petroleum Geologists, regional meeting, Commodore Perry Hotel, Austin, Tex., October 18-20.

Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex., October 19.

Independent Petroleum Association of America, Shamrock Hotel, Houston, October 21-23.

American Institute of Electrical Engineers, fall general meeting, Hotel Cleveland, Cleveland, October 22-26.

Society of Exploration Geophysicists, eastern regional meeting, Webster Hall Hotel, Pittsburgh, October 25.

Society of Automotive Engineers, diesel-engine division, Drake Hotel, Chicago, October 29-30.

Society of Automotive Engineers, fuels and lubricants division, Drake Hotel, Chicago, October 31-November 1.

November

Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, twenty-ninth annual meeting, Roosevelt Hotel, New Orleans, November 1-2.

American Association of Petroleum Geologists, Pacific section annual fall meeting, Ambassador Hotel, Los Angeles, November 1-2.

American Petroleum Institute, thirty-first annual meeting, Stevens Hotel and Palmer House, Chicago, November 5-8.

Southwest Research Institute, second conference on coastal engineering, Rice Hotel, Houston, November 7-10.

Gulf Coast Association of Geological Societies, first annual meeting, Roosevelt Hotel, New Orleans, November 15-17.

Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver, November 15-17.

American Society of Mechanical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 25-30.

Society of Exploration Geophysicists, regional meeting, Baker Hotel, Dallas, November 19-20.

Twenty-third Exposition of Chemical Industries, Grand Central Palace, New York City, November 26-December 1.

December

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Chemical Specialties Manufacturers Association, thirty-eighth annual meeting, Mayflower Hotel, Washington, D. C., December 3-4.

Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex., December 7.

NOMADS

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Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: September 11, luncheon, Downtown Athletic Club; September 18, golf party, Knoll Golf Club, Boonton, N. J.; October 1 and October 29, regular meetings, Louis Sherry's; December 8, Christmas dinner dance, Hotel Pierre.

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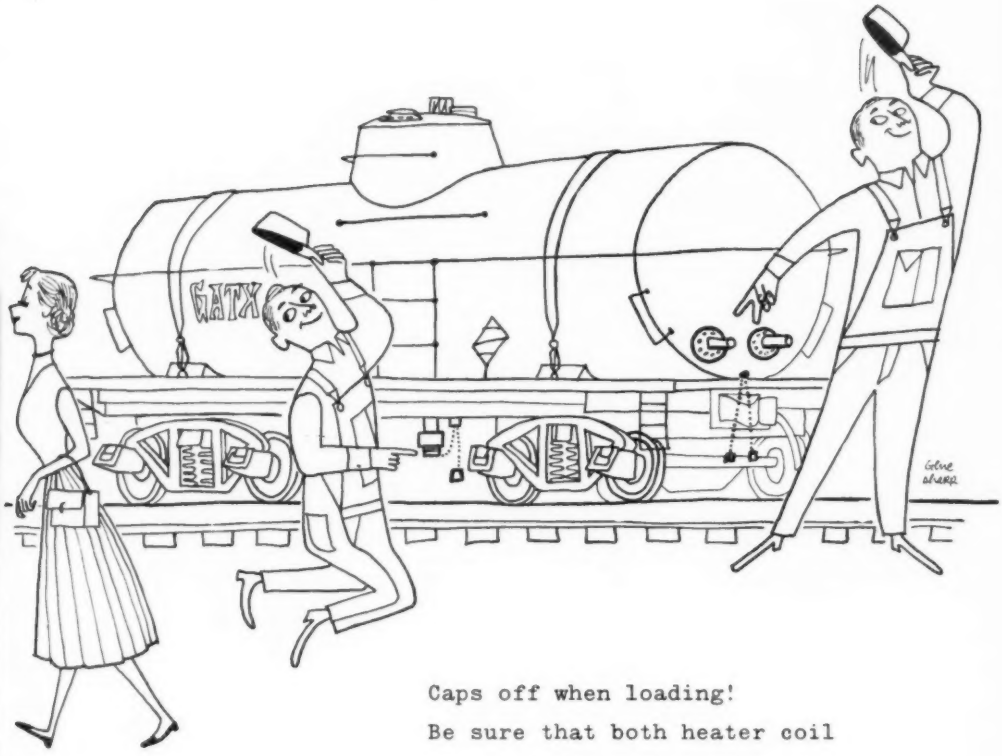

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JOURNALLY Speaking

Little Progress

PETROLEUM promotes progress, and in this country progress is assumed to mean shucking off the old and embracing the new. Not so, however, in Borneo, where the Sultanate of Brunei is said to have an oil income of $10,000,000 per year.

Three-quarters of Brunei's population, once primitive fishermen and farmers, are now employed by the oil business in one way or another, and oil has transformed their thatched villages into modern and prosperous cities. That's progress of a sort, but it hasn't yet altered Brunei's centuries-old traditions and customs. Recently a new sultan, a member of a dynasty which has existed for more than 500 years, was crowned in a ceremony which retained all the trappings of ancient Oriental splendor, complete with flamboyant procession of the monarch's gilded litter, scarlet-clad flagsmen, spearmen, sword carriers, and bearers of the symbolic umbrella and the royal betel nut.

The Oil Industry Information Committee ought to look into this. We understand that there wasn't a symbolic oil derrick or royal pumping jack in the whole parade.

Good Mixture

DON'T tell an oil man that oil and water don't mix. The problem of water in oil wells has plagued producers since Drake. They want oil, and never did have much use for water. Now, however, oil men are finding it to their advantage to use their equipment and skill to go after water.

Item: Arabian American Oil Co. is engaged in a big project in developing water wells for drinking and irrigation in sun-parched Saudi Arabia. It finds that this pays off handsomely, not only for its own personnel but through raising the living standards of the entire population.

Item: In southern California recently oil drillers have brought in spectacular artesian wells from strata never reached by water-well drillers, and these wells have been a godsend to ranchers and stockmen who have lowered their local water table 140 ft. through 50 years of pumping. With the Los Angeles area gaining people faster than it can find additional water supplies, the oil industry may be called on to prevent southern California from turning into the desert Saudi Arabia used to be.

Seven Come Eleven

WE never thought we'd live to see the day when our favorite oil publication would print an article on how to shoot craps. But it happened—on page 250 of the July 26 issue.

It's a technical article, complete with graphs, and tells how to figure your averages. The blurb at the top of the page says that the two authors are experienced in research and skilled in the knowledge of the probability, and the article gives evidence that they have done a thorough job of research on the probabilities of African dominoes. Of course they try to cover up by explaining that this line of research has some sort of bearing on and value to the work of refining engineering and operating, but we lost the thread of this argument somewhere between "standard deviation" and "statistical measure of the normal distribution."

For some time now we have been quietly building a list of the different sciences put to practical application by this amazing petroleum industry, and now we can add one more—the science of crap shooting.

Manhattan Move

OUR New York branch is all hepped up over its new quarters, or will be as soon as the boys get everything located following the moving operation. The new offices, at 500 Fifth Avenue, Room 2114, are, according to the glowing reports reaching Tulsa, far more spacious and convenient than the old cubbyhole which the Journal used for many years.

Oil men in, or visiting, Manhattan are invited to drop in. If you have any information about the industry, tell it to International Editor Dahl Duff or Refining Editor George Weber. And if you're anxious to place an ad, Chuck Wardley or Bob Caird will whip out a fountain pen at the drop of a rate card.

--Henry D. Ralph

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April 25, 1951

The International Nickel Company, Inc.
67 Wall Street
New York 5, New York

Attention: Development & Research Division

Gentlemen:

We wish to express our appreciation for the service of technical advice which has been made available to us in the past in connection with our development of new and improved equipment for the oil industry.

We manufacture a complete line of equipment for drilling and servicing oil wells. For dependable oil field service, machines must be made of materials capable of being subjected safely to extremes of stress and fatigue effect.

Friction clutches are a very important component in drilling and servicing equipment. The Cardwell "Flex-Disc" clutch fulfills the rigid requirements for such oil field operations. The flex plates and finger spring portions of these clutches must be made of the highest quality material, possessing high strength, toughness and resistance to fatiguing action over protracted periods of use.

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THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

The OIL AND GAS JOURNAL

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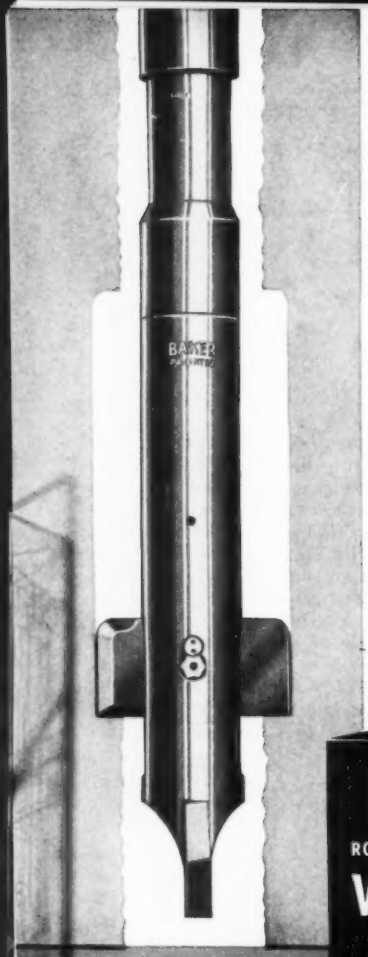


FOR SAFE, LOW-COST HOLE ENLARGEMENT

. . . no other tool is equal to the BAKER ROTARY WALL SCRAPER.— When it is desirable to enlarge the diameter of an open hole to an extent considerably greater than the diameter of the casing, you can depend upon this strong, safe Wall Scraper with blades which open positively when pump pressure is applied. The uncased hole *can be enlarged at any point,* and by changing to progressively larger sizes of blades, an amazingly increased diameter can be secured. Example: No. 6 size Scraper can be run safely through 9⅝" API casing, then will ream from a minimum of 9¼ inches to maximum of 19 inches by changing to increasingly larger sizes of blades.

RUGGED BLADES CLOSE SAFELY

Baker Wall Scraper blades have extra-long vertical cutting edges which prevent any tendency to "corkscrew" and insure scraping the maximum footage of full-gauge hole. And, when the Scraper is to be removed from the hole, pumps are shut down and a strong spring aids in closing blades into body. These blades are made from alloy steel forgings, and their cutting surfaces are hardfaced and set with tungsten carbide inserts to insure long cutting life.

MANY IMPORTANT USES

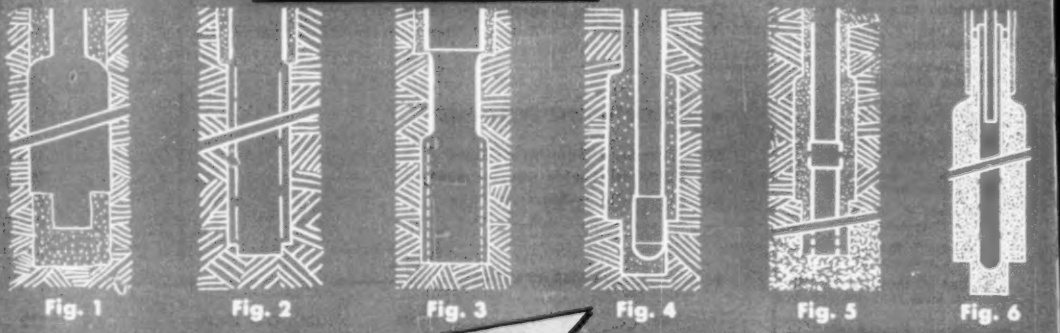
THE BAKER ROTARY WALL SCRAPER is extremely versatile and is successfully and economically used for many worthwhile applications, a few of which are shown below. It will pay you to learn all about the Baker Rotary Wall Scraper (Product No. 500-D) from your BAKER (or Composite) CATALOG, or better yet, ask the Baker representative in your area for helpful suggestions as to how this efficient tool will fit right into your drilling program.

BAKER

ROTARY HYDRAULIC EXPANSION

WALL SCRAPER

PRODUCT NO. 500-D



These typical uses illustrate a few of the many worthwhile applications of the Baker Rotary Wall Scraper.

Figure 1—WATER SHUT-OFF TESTS are made after rat-holing below the shoe, "wall scraping" for a vertical distance of 5 feet or more to the gauge of the original hole (or slightly beyond). Figure 2—ENLARGING HOLE TO SET CASING OR LINER with maximum ease and safety. Figure 3—REMOVING MUD SHEATH from the face of the formation to permit cement to bond with original formation. This same procedure is used to scrape the face of the oil sand to increase production. Figure 4—BOTTLENECKING to insure complete encasement of the shoe joint with cement; also to minimize hazard of channeling at this vital point. Figure 5—ENLARGING HOLE FOR C.P. JOB—showing "bottlenecked" section with casing or liner serving as water string above, and oil string below, the cementing point. Figure 6—GRAVEL PACKING is easily and effectively performed when the hole has been enlarged with a Baker Rotary Wall Scraper.

BAKER

OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Importance of Williston

Two successful oil wells completed in the Williston basin this summer have turned the eyes of the entire oil industry to this area of the Dakotas, Montana, Saskatchewan, and Manitoba.

Is oil so scarce, or wildcat strikes so unusual, or prospecting areas so few that the completion of two moderate-sized wells is the cause of a virtual stampede to this region?

The real significance of the Williston discoveries is far more basic than such explanations. Actually the two discovery wells are not large producers as yet, and their proven reserves are only a drop in the national bucket. Discovery wells this large are brought in every week in the established oil states with only routine or local attention. There are plenty of undrilled prospecting areas in the country which in many ways are more attractive to most wildcatters than the Williston basin.

The chief significance of the Williston developments lies in two things: Commercial possibilities have now caught up with geological probabilities; and a whole new vista of exploration thinking is unveiled.

For years the presence of oil was suspected in many areas difficult to explore with the older prospecting tools and methods, and remote from established markets and transportation facilities. During the past decade new equipment and techniques have been developed which can locate favorable prospects and make it both practical and profitable to wildcat in large, deep basins lacking in prominent structures.

Williston is such an area, and the discoveries there demonstrate that oil can be found in places where older concepts of petroleum geology considered it most unlikely. Williston is so big, so covered with glacial deposits, and has so few definite structures that it was generally unattractive.

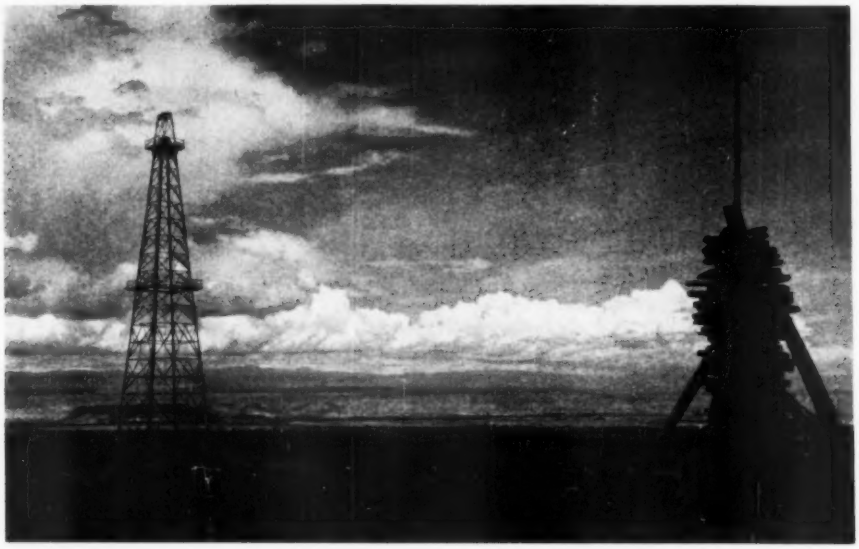
When the price of oil was low and the nation's producing potential was well above the level of demand there was little incentive for costly exploration in deep, untested areas, particularly those, like Williston, located far from large consuming centers. Present economic conditions promise a payout for such investments.

Amerada's strike in western North Dakota and Shell's more recent discovery in eastern Montana lie 120 miles apart in a basin perhaps 200 miles in diameter. There is good likelihood that more discoveries in the region will justify the construction of a pipe-line outlet to provide a market—which is an essential to any producing operation.

So Williston illustrates the way of petroleum progress. The industry is constantly advancing its concepts of the occurrence of oil and its techniques for discovery and production, and it puts those into practice just as rapidly as there is any commercial justification.

So long as the industry has the economic incentives to continue this process, the nation need not worry much about running out of oil.

THIS WEEK



UNORTHODOX UINTA.—Utah's Uinta basin is now definitely rated high in potentialities for developing enormous reserves. More and more major companies are moving into the basin, which has accumulations in impure carbonate lake deposits, once looked upon as nonmarine and barren of oil. Shown here is the 2 Duchesne Ute-Tribal, being drilled jointly by Carter Oil Co. and Continental Oil Co. This week it was making hole below 1,700 ft. The well is an offset to the Duchesne discovery, recently completed for 442 bbl. on choke. At right is a triangulation station erected by a seismograph crew.

ACTIVITY—Crude production averaged 6,144,425 bbl. daily for week ended August 18, down 14,250 bbl. daily. . . . ¶Total well completions increased to 935 from 896 for previous week. . . . ¶Wildcat completions increased 8 wells for the week to 234. . . . ¶Rotary rigs operating in United States on August 13 totaled 2,660, off 2 rigs from the all-time high a week earlier. . . .

TRENDS—Production of crude and field condensate for September is forecast at about 6,275,000 bbl. daily. . . . Crude imports are expected to average about 525,000 bbl. daily for a total new supply of 6,800,000 bbl. daily. . . . If crude exports, transfers, and losses are 150,000 bbl. daily, new supply will support runs of 6,650,000 bbl. daily without reduction in crude stocks. . . .

PIPE LINES—Mid-Valley tells contractors to begin work on six booster-station projects. . . . New stations will increase capacity of 1,000-mile crude line from East Texas to Ohio by 50 per cent. . . . ¶Tennessee Gas completes 303-mile main-system extension in New York, bringing near completion an expansion program to add capacity of 1,200,000 cu. ft. daily. . . . ¶Basin & Ozark system to install largest oil-line centrifugal pump near Hamlin, Tex. . . . Seven similar pumps to be added later to increase throughput by 100,000 bbl. per day. . . .

ECONOMICS—Imports of crude oil in June set new record with an average 552,000 bbl. daily, increase of 18,000 bbl. daily over previous record level. . . . Total imports of crude and products averaged 865,000 bbl. daily in June. . . . ¶PAD forecasts crude output in United States of 8,000,000 bbl. daily in 1955, based on exhaustive analysis of NPC and other forecasting methods. . . . Only requirement, PAD says, is continuation of drilling at rate of 43,400 wells per year. . . .

REFINING—PAD official cites extremely tight avgas-supply situation—a complete reversal of last spring's forecast. . . . Shortage laid to heavy increase in foreign military flying and shutdown of Abadan refinery. . . . Domestic refiners urged to take extraordinary measures to remedy situation. . . . ¶Sun Oil Co. begins razing of old steel plant and clearing of site for new Sarnia refinery. . . .

PRODUCTION—Texas boosts September allowable to 3,059,367 bbl. daily after "recommendation" of PAD officials, who asked action to meet threat of shortage caused by shutdown of Abadan refinery. . . . If shutdown lasts another 2 months, PAD men tell Texans, state might have to drop its "across-the-board" allocation policy. . . . Group also tells Louisiana officials increased production there would be "wise" move. . . .

NATURAL GAS—PAD order limits gas-service expansion in 15 states and District of Columbia. . . . Curbs apply principally to large-volume users and central space heating in states where regulatory bodies do not choose to exercise control. . . . ¶Production still holding to fast pace in Texas. . . . Figures show bigger percentage of total is being marketed this year. . . . ¶Phillips and Humble join to build new natural-gasoline plant in Spraberry development of Permian basin. . . .

Needed: More Avgas

Increased foreign flying, Abadan shutdown combine to upset spring forecast of declining last-half demands

George Weber

ALMA, Mich.—In contrast to last spring's forecast of a lessened demand for United States produced aviation gasoline during the last half of this year, the situation at present is extremely tight.

Addressing a regional meeting of Western Petroleum Refiners Association here last week, T. L. Apjohn, assistant director of the refining division of the Petroleum Administration for Defense, told Michigan refiners the unstinting cooperation of all refiners is being earnestly solicited.

Apjohn, who is in charge of the aviation-fuels program for PAD, presented the first over-all appraisal of the situation made public since April. The change in the short-term picture is the result of several factors.

High foreign demand.—Foreign demand figures largely in the reversed trend. Foreign governments have sharply increased their requirements. This became apparent in June and has two causes. Military aid from the United States has permitted a stepping up of military flying abroad. Further, the need for insuring adequate supplies for direct military use in Korea and backup areas last year and early this year resulted in a severe curtailment of supplies to foreign countries. Available stocks generally were down to an unhealthy 30-40-day operating level. A higher level of supply must be maintained indefinitely.

In addition to these factors, the closing of the Anglo-Iranian Oil Co. refinery at Abadan removed 18,000 bbl. per day of Grade 100/130 aviation-gasoline production from supply. The industry is under way in establishing production to meet this added demand.

Generally, said Apjohn, extraordinary measures are involved, such as the use of selective polymer as alkylation feed and the transportation of feed stocks from one refinery to spare alkylation capacity in another. Full cooperation of the industry will be necessary if the entire demand is to be met soon.

Extended outlook. — Possible future demands for avgas are not going to be met by the expansion in United States alkylation capacity currently under way. Although an appreciable expansion has begun with no further inducements than necessity certificates and priorities assistance for materials, long-term demands in the future under present mobilization conditions call for offering refiners greater incentives.

Accordingly, the Armed Services and PAD have proposed a special 5-year alkylation-facilities contract to be offered the industry, where necessary and justifiable to provide reasonable protection to the refiner.

This incentive has as its object the adding of 31,000 bbl. per day to alkylation capacity over and above that now operating or building. As a beginning, 7 million dollars has been appropriated and earmarked and 75 million dollars more have been included in the Defense Department's budget for 1952. As soon as the full amount is appropriated by Congress, the Armed Services plan to make an official announcement of the full program and invite refiners to submit proposals for review.

The avgas outlook for an extended mobilization period is subject to many variables, but increased demands must be anticipated. The presently discussed expansion of our own Air Forces from 95 to 150 groups would be a most significant factor. In addition to the hard-to-predict Korean war demand, we must be prepared to meet the demands for military action in other areas.

Emergency requirements. — Contrary to general opinion and in spite of the replacement of reciprocating-engine aircraft with jets, peak demands for high-octane-number aviation gasoline during an all-out war requires a considerable expansion of our basic-producing facilities—particularly alkylation, said Apjohn.

New catalytic reforming units now operating or going in will provide a substantial assist in contributing aromatic concentrates required for avgas blending. Many of these units will undoubtedly be called upon to contribute to the program.

The catalytic reformate suitable for avgas blending, said Apjohn, should contain at least 75 per cent aromatics and with 4.6 ml. TEL per gallon, should have an F-3 octane number of 96 to 98 and an F-4 blending-index number of 170 to 190. The 90 per cent point should not exceed 285° F.

Jet fuels.—Apjohn reviewed the specifications of the JP-3 and the more recent JP-4 grades of jet fuels, pointing to the lowered vapor pressure as the principal revision. It is understood that the military plans to standardize on JP-4 as soon as possible, and bid requests for supplies of jet fuel for the first half of 1952 are expected to be based largely on JP-4 rather than JP-3 specifications.

Further changes are also expected. More significant gum content and stability requirements are in the offing. The gravity range is felt to be too broad, and the presently specified 40°-58° A.P.I. spread may be reduced to 46°-56° with only a minor effect on over-all availability.

Some concern is felt regarding the large quantities of aromatics present in the heavier jet-fuel fractions, since they are believed to contribute substantially to carbon deposition in jet-engine combustion chambers. If a suitable procedure can be found, there is little doubt that some limitation on aromatic content of the fraction boiling above 400° F. will be included in the specification, said Apjohn.

"All of these changes will somewhat limit the amount of jet fuel available. Only one other possible change is under consideration, and that is an increase of the freezing point to some level above minus 76° F. Inasmuch as this is a change favorable to the refiner and to increased availability, it will probably be the last to be accomplished."

Civilian outlook.—Roughly the same civilian picture still holds true for a sustained emergency. The motorist would probably get very little gasoline, but what he got would be of good quality. The trend might well be toward lower-volatility diesel fuels and heating oils and generally lower-quality kerosine.

A technical group of the Association of American Railroads is presently investigating the effects of this possibility, but PAD has no knowledge of a similar program having been launched by either oil companies or oil-heating-equipment manufacturers. Apjohn added that the railroads are beginning to learn that they don't need the high quality diesel fuel they had previously thought necessary.

Two factors are necessary to insure essential quantities of fuel at satisfactory levels during an emergency. The will to build toward an adequate industry position has already been expressed by the petroleum industry, Apjohn said. The second factor, concerning the availability of materials, remains to be completely resolved. "Properly coordinated efforts of government and industry through the medium of PAD will, we hope, go far toward solving this problem."

Flood Victim Recovers

Great Lakes' Kansas City terminal operating after 5-week shutdown; here's how company met special flood problems

KANSAS CITY, Kans.—Great Lakes Pipe Line Co. started truck and tank-car deliveries August 20 from its Fairfax terminal, the first since flood waters forced a shutdown of the terminal July 13.

The terminal here is one of 15 of the Great Lakes system serving Oklahoma and Kansas refineries, to which it is connected by two 12-in. and three 8-in. lines. The system extends as far north as Grand Forks, N. D., and Minneapolis, with connections at several intermediate points.

The reopening of the terminal loading facilities about 2 weeks ahead of the original program is the result of an around-the-clock schedule in which management and employes, including a number of technicians, were brought in from other points on the system. The main station pumping equipment, which has been replaced at other points with portable installations which pump products north from here, will be in operation in a few days.

The manner in which the Great Lakes organization kept flood damage to a minimum and devised means to resume normal operations will be of interest to the pipe-line industry generally, including those connected with related activities. While the terminal property had never previously been flooded over a period of 21 years, the station, as a precautionary measure, was shut down on July 13 in response to flood warnings. Preparations to protect the property were started at that time.

The terminal is located in the large Fairfax industrial area at the confluence of the Missouri and Kansas rivers. Dike building and other measures carried out in recent years were thought to have made the district safe from floods. The terminal is part of a Mid-Continent and Middle West system, which now has a delivery capacity in excess of 200,000 bbl. daily. Working storage of 28 tanks varying in size from 17,000 to 80,000 bbl. daily is required to operate the local terminal. To prevent floating, where necessary, water was pumped to the tankage. Valves were closed at the tanks.

Property inundated.—On July 14, when the dike on the Missouri River broke, the entire property was covered by water, the depth being 13½ ft. in the station with approximately the same depth around the tankage.

Several tanks shifted on their bases but none moved entirely off base. The longest shift was made by a 37,500-bbl. tank which came to rest on the adjoining fire wall. This tank broke loose from its pipe-line connection, and a small leak developed at a nipple between the valve and tank. When this was detected, a connection was made by hose to a city water hydrant and water flowed into the tank. As the water settled in the tank it escaped instead of gasoline. When the leak was repaired the water was removed through the tank sump.

The immediate objective was to prevent leakage of gasoline, which could catch fire and result in heavy damage to the entire area. Owing to the precautions taken there were no fires at the Great Lakes terminal nor at the adjoining large refinery of Phillips Oil Co. (Phillips Petroleum Co.). The district was patrolled by row boats equipped with explosion meters to test for inflammable mixtures. The management of the Great Lakes company and other concerns are high in their praise of the work done by city and county officers and the Kansas National Guard in evacuating and policing the area, thus helping to prevent fires and looting.

Rehabilitation.—On July 16, before the water had receded, a meeting was held by company executives, departmental heads, and technicians to plan a rehabilitation program. Approximately 100 skilled workers were called in from other locations and given assignments which were carried out on a 24-hour-day, 7-day-week schedule, as soon as conditions permitted them to begin work.

Portable pumping units powered with gasoline engines were used to wash the walls as the water receded and so far as possible remove the several inches of muck from the equipment and the station floor. Water was pumped from inside of the fire walls. The cleanup job proved to be a major undertaking.

By July 23 it was determined that the 12-in. and 8-in. main lines were not damaged, and they were placed in operation to the north and northwest, again bypassing the Kansas City station. To offset the loss in pumping capacity, two 1,200-hp. Allison airplane-type engines were installed at Leavenworth, Kans., and two at Paradise, Mo. The company previously had used this equipment to increase the capacity of its system pending the installation of additional pumping at its main stations. Through the use of these units it has been possible to maintain the movement north and northwest from Kansas City at about 90 per cent normal gasoline capacity.

The main station equipment at Kansas City includes three 700-hp. Rannett electric pumping units. They are connected to the 8-in. lines. In the postwar enlargement program four 1,000-hp. electric-power centrifugal pumps have been installed—two each for the 12-in. lines.

The principal task after the station had been cleaned was to repair the motors. Two of the 1,000-hp. units were sent to an outside manufacturing plant to be dried. The company installed its own drying equipment to dry the other two 1,000-hp. motors and also the motors on the Rannett units. In this operation an oil burning furnace was connected to a metal hood over the motors. The motors were dried slowly with maximum temperatures of 212° F. Excessive temperatures burn out the insulation.

The repair of the pumps was not difficult. They were cleaned and repacked and were then ready for service. The main transformers were not damaged but smaller transformers had to be repaired. Some of the electrical equipment had to be replaced and part was sent back to the manufacturers for factory repair. Most of this equipment has been returned and has been installed.

The smaller motors and pumps used in loading trucks and tank cars did not present as difficult a repair job as did the major equipment. Approximately 100 trucks are loaded daily at the terminal and this operation is now normal. The terminal also operates a six-tank car loading rack. The movement of the Great Lakes system consists of gasoline and distillates.

New Imports Record

Crude shipments average 552,000 bbl. daily in June

CRUDE imports into continental United States averaged 552,000 bbl. daily in June to establish a new record. Previous high was set in January 1950 at 534,000 bbl. daily.

Total imports of crude and products averaged 865,000 bbl. daily, a decrease of 10,000 bbl. daily from the average for May but up 38,000 bbl. daily over the same month last year.

Total imports in January averaged 1,005,000 bbl. daily and held to 923,000 bbl. daily in February. Since that time the average for each month has been less than 900,000 bbl. daily due to the seasonal decline in imports of residual fuel.

Exports.—Exports from continental United States, excluding shipments to territories, averaged 372,000 bbl. daily or only 1,000 bbl. daily greater than in May. The large gain in crude exports and the small increase for gasoline were about balanced by decreases in shipments of kerosine and distillate fuel.

Further gains in product exports will be shown in the reports for July and August. Larger shipments from this country have been required to meet some of the foreign demands

that normally are supplied from the Abadan refinery in Iran, now shut down pending outcome of the British-Iranian dispute over oil nationalization.

IMPORTS INTO CONTINENTAL UNITED STATES

(Thousands of barrels)

	June 1951	May 1951	June 1950
Crude—			
Mexico	794	856	341
Colombia	1,491	1,279	1,314
Venezuela	9,401	9,964	9,524
Kuwait	3,056	1,561	2,322
Saudi Araba	1,578	2,028	1,099
Other	227	331	.....
Total crude	16,547	16,019	14,600
Daily average	552	517	487
Products—			
Residual fuel	8,606	9,768	8,659
Other products	781	1,329	1,544
Total products	9,387	11,097	10,203
Daily average	313	358	340
Total all oils	25,934	27,116	24,803
Daily average	865	875	827

EXPORTS*

(Thousands of barrels)

	June 1951	May 1951	June 1950
Crude	2,342	1,791	3,095
Gasoline	2,512	2,236	1,422
Kerosine	387	666	26
Distillate fuel	1,144	1,866	608
Residual fuel	2,471	2,636	1,398
Lube oils	1,407	1,478	916
Other products	898	830	475
Total all oils	11,161	11,503	7,940
Daily average	372	371	265

*Excludes shipments to territories.

Industry Briefs

GOLDEN, Colo.—Ground was broken last week for a new $1,150,000 petroleum-engineering building on the campus of the Colorado School of Mines. The building will provide 60,000 sq. ft. of floor space for the producing and refining departments, now housed in converted wooden barracks.

TULSA.—A company-wide salvage campaign by Sunray Oil Corp. has directed 820 tons of scrap back to the steel industry through scrap dealers. An additional 129 tons from all departments is expected to be collected by September 1, and the effort will continue as long as the national emergency exists, the company said.

AUSTIN.—Oil and gas taxes produced $10,814,364 in July, building up the state's general revenue fund which had slipped near the red-ink level earlier in the year. During the first 11 months of the fiscal year, the crude-oil gross-production tax has produced $102,104,580, an increase of $30,000,000 over the same period last year, and natural and casing-head gas taxes totaled $12,854,751 during the 11-month period, up $3,500,000.

NEW YORK.—The steel industry provided 441,000 tons of steel for oil and gas drilling operations during the first half of this year, according to a study by the American Iron and Steel Institute. The figure represents 1.1 per cent of total steel marketed, compared with 0.8 per cent of the total during the first half of 1950.

NEW YORK.—Distribution of the envelope enclosure "The Big Job Ahead" is expected to exceed 4,000,000 copies by the American Petroleum Institute. The leaflet, produced by the Oil Industry Information Committee, calls attention to the tremendous task faced by oil men to keep up with rapidly increasing civilian and military demand. More than 600,000 copies already have been ordered by oil companies for distribution to customers in advance of Oil Progress Week, October 14-20.

Lease Sale Set

WASHINGTON.—More than 1,000 acres of land in Louisiana and Colorado will be put on the auction block for buyers of oil and gas leases in two sales announced last week by the Bureau of Land Management.

On August 29, the bureau will open sealed bids on 44.21 acres of land in the known geologic structure of the Caddo field, 20 miles northwest of Shreveport. Bids will be opened August 12 on two parcels totaling 1,040 acres in the Wilson Creek field, 10 miles north of Meeker, Colo.

The usual procedure will be followed of awarding leases to the bidders of the highest bonuses at an annual rental of $1 per acre and royalties of 12½ to 25 per cent for oil and 12½ to 16⅔ per cent for gas.

SOUTHWEST

Record Texas Output

Commission sets September output rate above 3,000,000 bbl. daily for first time in history; further hike possible

ABILENE.—The Texas Railroad Commission has set permissible oil flow rates at record high levels for the month of September.

The new allowable represents an increase of 76,861 bbl. over the August 11 figure of 2,892,506 bbl. daily, a total of 3,059,367 bbl. per day. The increase is derived from a 24-day producing pattern generally over the state in a 30-day month, and it marks the first time that daily allowable production has gone over the 3,000,000-bbl. mark.

The increase was ordered in the face of increasing crude and product stocks. The decision was influenced by Petroleum Administration for Defense officials, who asked for more crude and products to offset those lost by the shutdown of the huge Abadan refinery in Iran, and by a recent strike in the large Aruba refinery in the West Indies which cut production there by one-third.

The PAD officials—Richard G. Lawton, A. P. Frame, and Cecil Burrell—said extra crude is necessary so that part of the crude now coming into the United States and Canada from foreign countries can be diverted to western Europe to fill excess refining capacity that now exists there.

It was estimated that transportation facilities were available to handle an additional 175,000 bbl. of crude per day in the United States. It was stated that of this amount 150,000 bbl. daily is available in Texas and 25,000 bbl. is available in the Mid-Continent area. A spare refining capacity of 190,000 bbl. daily is reported to exist in western Europe.

ALLOWABLES BY DISTRICTS

District—	Sept.	Change
1. Southwest Texas	37,504	+ 407
2. Gulf Coast	175,303	+ 5,235
3. Gulf Coast	524,014	+ 11,752
4. Southwest Texas	281,187	+ 7,105
5. East Central	59,639	+ 1,622
6. East Tex. (outside)	124,613	+ 3,355
6. East Texas	282,478	+ 8,568
7-B. West Central	104,048	+ 2,075
7-C. West Central	115,546	+ 2,813
8. West Texas	1,053,059	+ 30,507
9. North Texas	199,647	+ 3,396
10. Panhandle	102,329	+ 8
Total	3,059,367	+ 76,861

Future problem.—Governmental officials agreed that increased production in the United States would effectively prevent any shortage of crude for several months, but said that if the situation doesn't change by the year's end the world-wide demand for crude would be impossible to supply even with United States facilities operating at maximum levels.

And if the Iranian shutdown prevails for just another 2 months, the PAD men said, the Railroad Commission might find it necessary to deviate from the "across-the-board" policy it has followed in the past in determining allowable production.

This change would be necessary, they said, because of transportation bottlenecks that exist in parts of the oil country, notably in West Texas where most of the excess producing capacity exists. Evidence presented at the hearing indicated that West Texas has approximately 33,000 bbl. daily in

excess crude capacity, but this would largely be taken up by the increase granted for September—30,507 bbl. daily. Texas' greatest capacity for moving crude exists in the older areas in East Texas where field production is limited by most efficient flow rates.

The 24-day flow rate was advocated by nearly all crude-purchasing companies represented at the hearing. A 19-day producing pattern will hold for East Texas field, 14 days in Pantex pool of Commission District 4, and 22 days in the Seminole area of District 8.

Multistate Fields

Louisiana shares oil pools now with Texas and Arkansas, may find soon it also holds part of a Mississippi field

Polly DeArmond

IF it is determined that a southern Louisiana wildcat actually is a stepout to a Mississippi field, Louisiana will have producing areas that extend into each state that borders it.

Before this year there were six multistate fields in this area: Joaquin-Logansport (Texas and Louisiana); Bethany (Texas and Louisiana); Waskom (Texas and Louisiana); Caddo-Pine Island (Texas and Louisiana); Rodessa (Texas, Louisiana, and Arkansas); and Haynesville (Louisiana and Arkansas).

In May, production from North Shongaloo field was extended across the Louisiana line into Arkansas, and there are possibilities that further drilling will prove two more such "dual" areas, shared by Louisiana with Texas and Mississippi.

North Shongaloo.—This Webster Parish field (No. 1 on map) was opened in June 1945 by Hunt Oil Co. 1 Roberts, which came in for initial production of 500 bbl. of 38.7°-gravity oil per day from the Pettit horizon at 5,734-44 ft. Located in 11-23n-10w, the well was drilled to 11,760 ft., plugged back to 5,770 ft.

The pool was extended into Arkansas by Stanolind Oil & Gas Co. 1 Pine Woods Lumber Co. Located 551 ft. from the south line and 660 ft. from the west line of 11-20s-22w, Columbia County, the test flowed 267 bbl. of 40°-gravity oil daily. The well was drilled to 5,860 ft., and final completion was made in the Pettit at 5,743-52 ft.

At the end of the first half of this year, 13 ventures, all producing wells, had been completed in the field, which covered 520 proven acres, and a high number of new locations and intentions to drill indicates rapid development of the area in both states.

Phoenix Lake.—Ohio Oil Co. opened this Calcasieu Parish Miocene pool (No. 2 on map) in March 1950. The discovery, 1 E. W. Brown, Jr., 20-11s-13w, went to 9,912 ft. Production was 291 bbl. of 43°-gravity oil from 7,781-82 ft.

Across the state line in Orange County, Texas, the same company brought in the 1 Lutcher-Moore, C. L. Higginbotham Survey, Abstract 414, for 284 bbl. of 40.8°-gravity oil on potential test of perforations at 7,983-87 ft. Further drilling must prove whether the new strike is a 1¼-mile extension of Phoenix Lake production or a separate field.

As of July 1, there were eight producing wells and one dry hole finished on the Louisiana side, defining 320 acres.

Sandy Hook.—This field, producing from two sections in the lower Tuscaloosa, was discovered in July 1948 by Humble Oil & Refining Co. 2 E. R. Ford et al, 13-1n-18s, Marion County, Mississippi (No. 3 on map). Initial production was 66 bbl. of 53°-gravity condensate daily from 8,979-99 ft. and 9,014-20 ft. The well was bottomed at 10,696 ft.

A possible extension southeast into Washington Parish, Louisiana, has been completed for 296 bbl. of 49.3°-gravity condensate per day. Production is from perforations at 9,004-10 ft. The wildcat, Humble C-1 Gaylord Container Corp., 47-1s-14e, was drilled to 9,059 ft.

Not counting this well, Sandy Hook field showed 13 producers and 2 dusters at the end of June, with the proven area covering 2,080 acres.

SHARING THE OIL.—Map showing location of seven fields shared by Louisiana with adjacent states and two more fields which soon may be proved to cross state boundaries.

Spraberry Change Denied

AUSTIN.—A request to employ 80-acre well spacing in a portion of the vast Spraberry trend of West Texas was denied here last week by the Texas Railroad Commission. All Spraberry drilling in the area has been on a 40-acre basis *(The Oil and Gas Journal, July 26, page 179)*.

Several major companies had joined the applicant, Magnolia Petroleum Co., in a steel-conservation move seeking wide spacing in Midland, Glasscock, Reagan, and Upton counties along the Spraberry trend where Magnolia has large holdings.

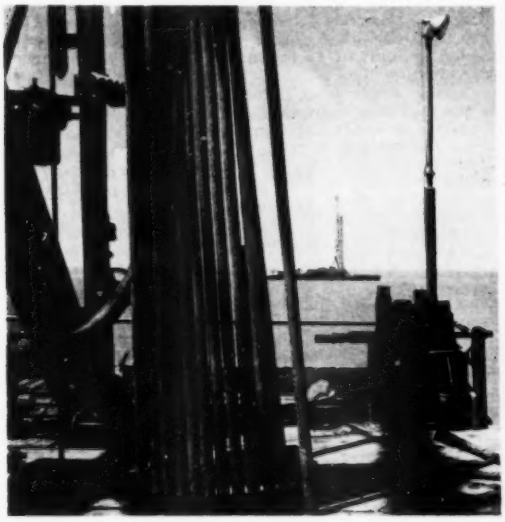
East Texas Ceiling Set

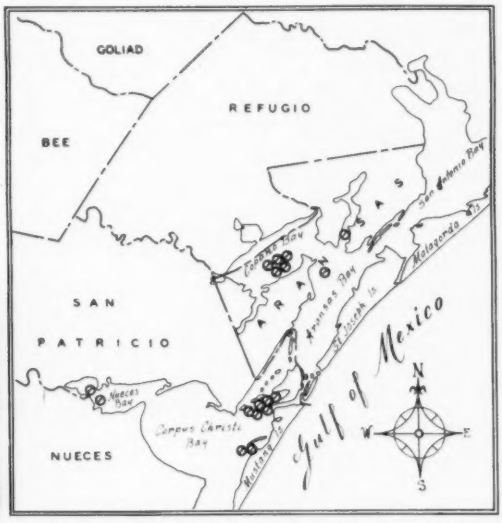
WASHINGTON.—A ceiling price of $2.65 per barrel at the receiving tank has been set by the Office of Price Stabilization for East Texas oil field.

The $2.65 figure is the ceiling price which has been applicable to about 96 per cent of the production in the field, OPS officials said.

The fixed price, however, will not apply to the other 4 per cent, which is being sold at slightly higher prices under contracts in effect prior to January 25 of this year.

The ceiling for East Texas crude was set in a supplementary regulation to CPR 32, issued last May 7, in which posted prices of January 25 were made the ceiling for all crude except where contracts at higher prices were in effect.





ACTIVE CAMPAIGN.—Drilling barges are out in full force in South Texas bays. In the picture at left, Phillips Petroleum Co.'s barge rig can be seen from Cotton Dickson Drilling Co.'s No. 2 barge in Copano Bay. At right is a map showing location of the 17 barges now drilling.

Barge Buildup

Seventeen bay wells now being drilled in two South Texas counties; further increase in drilling this year expected

F. Lawrence Resen

CORPUS CHRISTI.—The tidelands controversy may have quieted drilling in the Gulf of Mexico, but it hasn't put the damper on "over water" drilling.

Seventeen drilling barges are operating in bay waters of two South Texas counties and indications are that there will be more than 20 before the year is out.

The busiest spot is around Dagger Island, sometimes referred to as Redfish Bay, in the Corpus Christi Bay area of San Patricio County, where six barges are running. Close by, at Mustang Island, two more are operating, and farther westward, in Nueces Bay, another two barge rigs are in service.

In Aransas County, a short distance to the north of Corpus Christi, Copano Bay is another scene of high activity with five barges operating in the bay waters. A sixth rig is operating nearby in St. Charles Bay and a seventh, in Aransas Bay, is just a few miles away.

Phillips Petroleum. — Most active operator is Phillips Petroleum Co. which has three of its own barges in these waters and has two others under contract.

In Copano Bay Phillips has one company rig and has Cotton Dickson Drilling Co., Houston, and Calvin Foster Drilling Co., Alvin, drilling for the company.

Phillips is also operating two of its own rigs in Nueces Bay. Each of these is rigged up on two individual barge sections tied together with braces about 10 ft. apart. The space between the barges serves as the drilling slot. Foster's rig is similar in design. Such an arrangement allows the barges to be floated through narrow bridge openings into shallow waters where the rigging up may take place. Accessibility to bays and a savings in dredging costs make such arrangements practical.

Dickson is also drilling a well for Sun Oil Co. in Copano Bay and another for Sun in St. Charles Bay. Brewster & Bartlett is operating the remaining rig in Copano Bay, where the firm also is drilling for Sun. The rig operating in nearby Aransas Bay is a Humble Oil & Refining Co. barge rig drilling a wildcat.

Glasscock Drilling.—Foremost independent operator in Corpus Christi Bay area is Gus C. Glasscock Drilling Co., which is operating two rigs at Dagger Island and a third at Mustang Island. Glasscock plans to move two more rigs in at a later date. These are under construction at Bethlehem Shipbuilding Co. yards at Beaumont, along with a third rig which Glasscock is having built. One of the three will be of the double-barge type.

Kerr-McGee Drilling Co. has two rigs working at Dagger Island, and Otis Dyer has one. Salt Dome Drilling Co. has one rig operating at Mustang Island. The newest barge rig to begin operations there is Shell Oil Co.'s barge rig No. 2, which employs a new 13,000-ft. jackknife mast on a barge previously used with another rig.

Barge operations.—The important phase of the barge operations is the settling of the barges solidly on locations. A pattern followed in South Texas fields features use of shell "mats." The barge is moved into position over the shell, and water ballast is taken on so that the barge will settle evenly upon the mat. Piling usually is driven in close to the four corners of the barge before drilling operations commence. Mud pumps are usually used to jet the ballast water out of the barge when the well has been completed and the barge is to be moved. In shallow water the area around the location is dredged slightly to allow the barge to be moved into position.

The methods followed by the operators have been working successfully. In more than 50 wells drilled from barges, only one instance was re-

corded where the shell mat or the mud bottom failed to support the barge rig sufficiently to allow drilling operations to be carried on.

Gathering lines.—Most drilling in the bay areas is close enough to land to allow storage tanks to be set up on shore. Two-inch lines usually are run from several wells to headers, where they tie in with a main line running to storage tanks.

In Copano Bay, on Sun's leases, the headers are connected to shore by a 2-in. test line and a 4-in. main line. The test line is used to maintain a check on individual well production.

Copano production.—Several fields comprise the Copano Bay area. These are Fulton Beach, West Fulton Beach, Salt Lake, and Copano Bay fields. In the offshore areas of these fields 69 wells have been completed in 20 producing sands since the first barge entered the bay in December 1949.

Average well depth is 7,000-7,200 ft. Allowable for the wells is 101 bbl., and gravity of the crude is 40°. Drilling time averages 15 days, including the setting of 120 ft. of conductor pipe and 1,000 ft. of surface casing. Completions are primarily gun perforations.

Mustang Island.—Ten pay sands from the Frio sand series of Oligocene are producing in Mustang Island field. Approximately one-fourth of the wells completed in the field have been gas-distillate producers. A total of 46 completions have been made since the field was discovered in September 1949. Drilling time for the wells runs around 30 days. Wells usually are completed by setting casing through the sand and gun perforating.

CANADA

Gas Found in Saskatchewan

REGINA.—A significant Saskatchewan gas strike has been made by Royalite Oil Co., Ltd., and Albercan Oil Corp.

The discovery is the 1 Smiley, 31 miles east of the Alberta border and 100 miles south of Lloydminster field in western Saskatchewan.

This indicated gas discovery, which is expected to be drilled ahead to a projected depth of 4,500 ft., tested an estimated flow rate of 8-10 million cubic feet of gas daily from the Viking sand at about 2,300 ft.

This wildcat is southern Saskatchewan's second promising gas discovery in the current exploration program. The first was at Socony-Vacuum Exploration Co. and Western Prairie Exploration Co. 1 Tompkins, about 110 miles south of the 1 Smiley, which tested gas at a rate of 2 million cubic feet daily from a Jurassic sand (Hulett) near 3,650 ft. The 1 Tompkins, now drilling below 5,200 ft., has a projected depth of 6,500 ft.

The Viking sand is found in the basal portion of the Upper Cretaceous sediments. The formation and its equivalent are present over most of Alberta and in the southern half of Saskatchewan. The Viking sand is best known for the gas that it produces in Alberta from the foothills belt on the west to the Alberta-Saskatchewan border. The large Viking-Kinsella gas area of East Central Alberta with its estimated trillion feet of dry gas, produces from the Viking sand. The Viking sand is also known to carry oil in some localities, the most notable of which is Joseph Lake field, 50-22w4, in Alberta.

A map of Saskatchewan showing location of drilling wildcats may be found in the August 16 Oil and Gas Journal, page 185.

Sun Clearing Sarnia Site

SARNIA.—Sun Oil Co. has started demolishing the old Dominion Alloy Steel Co. plant and clearing the site for its new 10,000 to 15,000-bbl. refinery here.

T. E. Webster, president of Catalytic Construction Co., who visited the site with Clarence H. Thayer, Sun vice president in charge of manufacturing, said construction on the new refinery probably will begin next spring.

Bulk of the work, he indicated, will be completed in the summer and autumn, with refining equipment to be installed during the following winter. The refinery is tentatively scheduled to begin operating in March of 1953.

Pump Station Started

SARNIA, Ont.—Imperial Oil, Ltd., is constructing a $250,000 pumping station here in connection with its 185-mile products line from Sarnia to Toronto.

Comstock Midwestern, Ltd., of Toronto, has the contract, which will take 4 months to complete. First shipments of 12-in. pipe from England have arrived. The Sarnia-Toronto line will tie in with the new marketing bulk plant at London, with two 6-in. spurs running to Hamilton.

WEST COAST

Quake Knocks Out 30 Wells

LONG BEACH, Calif.—A mild earthquake in the Terminal Island area of Wilmington field near here knocked out 30 producing wells belonging to Richfield Oil Corp., Signal Oil & Gas Co., and Union Pacific Railroad last week.

The quake caused slippage along zones of weakness under pumping wells located on the mainland north of Cerritos Channel, and it is thought that casing and sucker rods may have been sheared.

This is the third quake since 1948 causing heavy damage to wells in the area. In 1948 and 1949 earth tremors shook Terminal Island itself, and operators are just now completing the task of redrilling 300 wells put out of commission then.

Cost of replacement was estimated by M. D. Hughes, chief harbor petroleum engineer, at well over $1,000,000. The previous quakes caused damage to production properties of over $10,000,000.

Search Not Dead

Navy to continue Alaskan hunt on year-to-year basis

DENVER.—The tentative decision to abandon the search for oil in Alaska has been reconsidered by the Navy Department and it is now planned to continue exploration work in Naval Petroleum Reserve No. 4 on a year-to-year basis contingent upon the results achieved and the availability of funds.

The new program was disclosed by Capt. R. H. Meade, director of Naval Petroleum Reserves, at his headquarters here, following reports received from industry advisers who have been assisting in the Alaskan exploration work. These advisers will meet in Denver in November to map out a specific program for 1952, following which Congress probably will be asked to make a further appropriation for the work.

The regular Navy Department appropriation bill, now pending in Congress, carries no funds for continuing the Alaskan exploration work beyond the end of the current year *(The Oil and Gas Journal, August 9, page 58)*. At the time this bill was being prepared, Captain Meade told the appropriations committee that the exploration program would be dropped a year earlier than intended because of the President's declaration of national emergency and the attending shortage of critical materials.

He added, however, that if the Secretary of the Navy should decide that the results obtained are very favorable, a request for funds for further work would be submitted.

Since that time Assistant Secretary John T. Koehler and other navy officials met in Fairbanks with civilian advisers and reviewed the entire program. As a result of this conference the department has decided to continue exploration work on a year-to-year basis. The original appropriation was for a 5-year program ending in 1952. Details of the work now planned for next year are expected to be worked out at the November conference in Denver.

Production Forecast

PAD predicts daily crude production at about 8,000,000 bbl. in 1955 if 43,400-well drilling rate is maintained

WASHINGTON.—A daily crude production of close to 8,000,000 bbl. can be developed in this country within the next 4 years, Petroleum Administration officials believe.

This increase, nearly 1,200,000 bbl. daily over the present average of around 6,800,000 bbl., needs only continuation of drilling at the 1951 rate and completion of around 43,400 wells annually.

The 1955 figure was arrived at by an exhaustive analysis of a number of crude-productivity forecasts by the PAD production division aimed at evaluating the reliability of various forecasting methods.

The forecasts covered by the study included one made by the production division last March on the basis of estimates of petroleum-regulatory agencies in all producing states and data from the National Petroleum Council committee on oil and gas availability; another made last month by the NPC committee on oil and gas availability; a "productivity trend" analysis developed by PAD; and a PAD forecast based on the relationship between productive capacity and annual additions to domestic petroleum reserves.

Bases vary.—The various forecasts analyzed were based on an estimated 1951 production average ranging from 6,790,000 to 6,988,000 bbl. daily. The 1955 estimates, as summarized in the accompanying table, ranged from 7,114,000 to 8,053,000 bbl. daily. However, those figures were the low and high seen by the NPC committee and the other estimates were remarkably close together, running from 7,613,000 to 7,997,000 bbl. daily.

"The relatively small differences between these forecasts, each made by a different method, is remarkable and attests to the general validity of the calculations," Deputy Administrator Bruce K. Brown said in making the results public. "Because the range between the various estimates is so narrow, I believe PAD is on solid ground in using these forecasts in its mobilization planning."

The "productivity trend" method of forecasting developed by PAD rests on the assumption that established historical trends in discovery and development of oil fields can be projected at least a few years into the future with confidence.

To calculate the contribution to productive capacity of the new wells completed in a given year—say 1950—the decline in productive capacity of the wells producing at the beginning of 1950 is estimated for that year; this decline is then subtracted from the actual productive capacity at the end of the preceding year (1949). This figure, in turn, is subtracted from the actual productive capacity at the end of 1950.

Calculations of the productive capacity for the years back to 1943 were made by this method to establish the trend, which then was projected forward for the years ahead to give the forecast.

Small-field gains.—In its report, PAD noted that smaller fields are playing an increasingly important part in the total productivity of the country and the relative contribution of larger fields is decreasing.

The report conceded that the rising trend in productive capacity may eventually end and a period of static or declining capacity may ensue, but it declared there is no evidence to indicate that this time is approaching.

"Oil is still being found in new geological provinces, and other large provinces are as yet practically untested," PAD declared. "Furthermore, large potential reserves undoubtedly exist even in the more highly developed areas at depths which have in the past been beyond the reach of the drill. As drilling technique improves, it will be possible to discover and develop these deeper reserves.

"Probably the most significant factor in present day discoveries, however, is the increasing application of subsurface geology within the highly developed areas," the report pointed out. "This method gains in usefulness as more wells are drilled in an area, because each well drilled furnishes geological information which may provide the clue needed to unravel some obscure structural or stratigraphic problem. For this reason, it is inconceivable that discoveries based on subsurface geology will suddenly cease," he said.

FORECASTS OF UNITED STATES CRUDE PRODUCTION CAPACITY
(Based on 43,400 Completions Per Year)

	Average productive capacity per year (Thousands of barrels daily)				
	1951	1952	1953	1954	1955
PAD estimate	6,879	7,161	7,375	7,510	7,613
PAD productivity-trend analysis	6,830	7,140	7,415	7,645	7,845
Estimate from crude-oil reserve-trend analysis	6,790	7,055	7,300	7,530	7,752
Liquid-hydrocarbon reserve-trend analysis	6,800	7,100	7,400	7,698	7,997
NPC committee:					
Upper range	6,988	7,333	7,624	7,854	8,053
Lower range	6,842	6,976	7,065	7,105	7,114

Fast Write-Offs Frozen

WASHINGTON.—Certificates of accelerated amortization of 85 per cent of $2,883,000 and 40 per cent of $497,000 for facilities for the production of tetraethyl lead at Deepwater Point, N. J., have been issued to DuPont by the Defense Production Administration.

A certificate for 80 per cent of a $1,000,000 pipe line also has been issued to the Lavaca Pipe Line Co. at Port Lavaca, Tex., to serve the Point Comfort Works.

The certificates were issued as DPA prepared to suspend further certifications for 60 days. Between October 30, 1950, and August 18, when the freeze became effective, more than $9,000,000,000 worth of construction had been okayed for quick write-off.

Five certificates for facilities for the transportation or storage of oil were also issued by DPA, as follows:

Coastal Terminals, Inc., 75 per cent of $71,915 for storage of gasoline at North Charleston, S. C.; L. P. Steuart & Bros., Inc., 85 per cent of $800,000 for storage of gasoline and fuel oil in St. Mary's County, Maryland; Smith Oil Transportation Co., Peru, Ill., 80 per cent of $250,000 for oil barges; Martin Oil Co., Inc., 50 per cent of $599,300 for storage of products at St. Louis; Texas Barge Line, Inc., Houston, 80 per cent of $310,000 for oil-barge transportation.

PAD Personnel Shuffled

WASHINGTON. — Several changes in organization have been announced by PAD, effective September 1.

Justin R. Wolf, general counsel, and Reid Brazell, director of refining, are leaving PAD to return to private life.

Elmer E. Batzell, finance counselor, will be promoted to assistant deputy administrator and general counsel, and C. E. Davis, deputy director, will take over as head of the refining division.

Other changes include the promotion of William R. Tarver, now assistant counsel, to a new position as associate general counsel, and Charles E. Gately will become assistant general counsel. George Gibson will succeed Batzell as finance counselor.

Defense Orders Issued

WASHINGTON.—The following orders have been issued by defense agencies:

Petroleum Administration for Defense

PAD 2, August 15: Imposing limitations on the use of natural gas, effective August 22.

National Production Authority

Amendment 1 to CMP Reg. 5, August 1: Amending MRO regulations on railroad equipment.

Direction 2 to CMP Reg. 5, Direction 2 to CMP Reg. 6, Direction 3 to M-6 and Direction 1 to M-11, August 10: To assure a continued flow of materials to the Missouri-Kansas-Oklahoma flood area.

Amendment to M-48, August 10: Permitting a wider use of bismuth for civilian production.

Amendment to Direction 3 to CMP Reg. 1, August 14: Providing relief for small users placing orders for steel, copper, and aluminum.

M-46A, August 15: Establishing a priorities system for oil operators' foreign operations.

M-80, August 15: Bringing boron, calcium, chromium, cobalt, columbium, tantalum, manganese, molybdenum, nickel, silicon, titanium, tungsten, vanadium, and zirconium under centralized control.

M-81, August 15: Supersedes M-30 and M-33 in control and allocation of pure tungsten and pure molybdenum.

PAD Asks Materials Advice

WASHINGTON.—Executives of 14 industry trade associations have been asked to name men who can assist the Petroleum Administration for Defense in a study and analysis of the operation of the oil-country tubular-goods program under NPA Order M-46.

In a letter to the association heads, Deputy Administrator Bruce K. Brown expressed his desire to receive constructive suggestions toward improvement of the program "to better accomplish the primary purpose of sound and equitable distribution of oil-country goods."

The men nominated by the associations will be invited to participate in a discussion of the program to open here September 5. The conference, Brown said, may extend over several days.

At this meeting, Brown said, all phases of operation of the tubular-goods program will be exhaustively analyzed, including the basic principles upon which the allotments have been made.

There has been considerable complaint regarding the allocation of tubular goods. Most of the complaints have been general in nature, but Brown wants to have the whole program dissected to see whether better methods and procedure for parceling out materials can be developed.

WATCHING WASHINGTON

Bertram F. Linz

Wallowing in Rubber

Given continuation of present supplies from the Far East and no war to use it up and the United States literally may be wallowing in rubber next year.

The Reconstruction Finance Corp. didn't exactly enhance its reputation by some of the loans it made, such as the well-publicized one to Texmass and others aired by congressional committees, but it is doing a bang-up job in expanding synthetic-rubber production.

Under the rubber act, synthetic-production facilities must be maintained at an annual rated capacity of not less than 600,000 tons of general-purpose and 65,000 tons of special-purpose rubber.

Back in 1949, production of GR-S was at its postwar low of 288,882 long tons. Last year, the RFC boosted output to 350,801 tons and this year it should top 600,000 tons.

But that isn't enough for RFC. It now has programed production for the fiscal year 1952 at the rate of 950,000 tons. The wartime high was 717,693 tons in 1945. To make this possible, 11 additional facilities have been placed in operation, bringing the total to 28.

Relating the accomplishments of RFC before a congressional committee, Stuart Symington, who left the National Security Resources Board to take over its administration, said that 65 per cent of the rubber now being used in this country is synthetic and RFC is now selling it for less than half the world price of natural rubber, without subsidy and at no loss. This modern synthetic product is considered as good as or better than natural rubber for most uses, Symington said.

Shift to Coal?

Oil-consuming industries on the East Coast may be required to shift to coal wherever possible, if the stoppage of Iranian shipments continues and a serious fuel-oil problem develops in this country, as it may well do.

A survey of the amount of oil that could be saved in this way was made recently by the Petroleum Administration for Defense and it is estimated it would approximate 50,000 bbl. a day, which would be a substantial contribution toward overcoming the shortage brought on in the Eastern Hemisphere by the cessation of Iranian shipments.

Another survey, to determine the amount of coal required to replace oil so diverted, is reportedly being made by the Defense Solid Fuels Administration.

So far, the oil industry has been able to fill the gap created by the interruption of Iranian oil production, but only by withdrawals from inventories the domestic industry had been building up as a hedge against winter demand. There is a definite limit to the extent to which inventories can be depleted for this purpose, and Deputy Administrator Bruce K. Brown already has warned domestic operators that they will have to go to extraordinary lengths to meet the situation.

Write-Off Freeze

Issuance of certificates for accelerated amortization of new industrial facilities has been halted for 60 days by Mobilization Director Charles E. Wilson. When authorizations are resumed they will be under new and much tighter regulations and on a limited scope.

The suspension is not expected to affect the oil industry seriously. The Petroleum Administration is pretty well along with its expansion program as indicated by the fact that recent authorizations have been largely for transportation and storage facilities. A provision of the freeze order, furthermore, provides for exceptions in the case of facilities urgently needed.

Approximately $9 billion of new or expanded facilities has been given quick write-off in the past 9½ months, but not without protests from Congress over both the extent of the program and the manner in which it has been administered.

The new regulations are designed to meet congressional criticism. Certificates will be issued only for facilities included within expansion goals set up by the Defense Production Administration and are to be on percentages reflecting the best available estimates of post-emergency usefulness. Percentages may be established on an industry basis by DPA.

The suspension of certifications also was due to the tight situation in critical materials such as structural steel. The shortage makes it unlikely that new construction beyond that now planned can proceed for several months except for the most urgent projects.

Gas Curbs Here

PAD order slows gas-service expansion to a walk in 15 states; new space-heating and large-volume users hit

WASHINGTON.—Expansion of natural-gas service in 15 states and the District of Columbia was placed under control by an order issued this week by the Petroleum Administration for Defense.

The order permits extension of gas service to new, large-volume consumers only with the approval of PAD, with certain exceptions.

The order is not effective in any state which sets up its own regulations to safeguard gas supplies, but PAD officials expect most states to accept the federal formula. Distributors seeking modification have until September 15 to show that their gas supplies are adequate.

Areas affected. — Connecticut, Delaware, the District of Columbia, those portions of Kentucky supplied by a subsidiary of Columbia Gas System or Louisville Gas & Electric Co., Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, those portions of West Virginia served by a subsidiary of Columbia Gas System, and Wisconsin are areas affected. This list is subject to revision as supply conditions change.

Restricted in scope, the order applies only to service to new, large-volume consumers and for central-space heating. Room is left for some expansion even here. It will not apply to service for homes started prior to August 22 or firm commitments made by gas companies before that date for the supplying of natural gas. Also, it does not apply to service to any present customer, to household use of gas for other than central heating, to manufactured gas, to fully interruptible service with gas not needed for underground storage, or to gas to be used for lease operations or well drilling.

Central space heating. — Regarding central space heating, companies may expand their service during the next 12 months to the extent of 1 per cent of the total number of customers of all kinds served in the community when the order went into effect.

It also provides that, in communities which had no gas service or fewer than 5,000 manufactured-gas consumers, a natural-gas seller may take on as many customers as he chooses during the first 2 years after beginning distribution. In any community recently converted to natural gas a seller may take on new customers during the first 2 years after conversion to the extent of 10 per cent of the total number of customers of all kinds at the time of conversion.

Line-pipe shortage. — Again stressing that limitations on natural-gas service are necessary solely because of inadequacy of line pipe and are in no way related to gas supplies, Deputy Administrator Bruce K. Brown pointed out that the order itself contains provision for its prompt relaxation wherever gas supplies are fully adequate to meet all demand.

Outlining the studies made by PAD over a period of months the discussions with the gas industry and consultation with the Federal Power Commission, Brown said.

"We knew, as the claimant agency for steel for the oil and gas industry, that steel—especially steel for pipe lines—was in short supply. We could see that not enough would be available to complete all the new pipe lines or pipe-line extensions we had hoped would provide ample gas for this winter.

"We knew that the lack of pipe lines to transport the gas might easily endanger defense industries. Those included both existing industries and defense plants PAD had been informed were being planned, many of which would require large quantities of gas.

"We knew that the problem involved was a regional one, for what happens to gas use in this city or that, this state or that, along a single integrated distribution system affects every user of that system all along the line.

"Under the circumstances, particularly in view of PAD's responsibilities for promotion of national defense, we could see no alternative to issuance of the order. To have done anything less would have been to shirk a clear-cut duty."

PAD Issues New Forms

WASHINGTON.—New forms, better suited to the purpose for which they are to be used, are now being distributed by PAD for use by operators in connection with applications for material.

The forms will carry the same designations as those used heretofore —PAD-15, PAD-16, PAD-17, and PAD 17DP. Sample copies are being sent to operators by mail, but additional copies may be secured from PAD in Washington or its field offices in New York and Chicago, field offices of the Department of Commerce, state oil regulatory authorities, oil-field supply companies and oil and gas trade associations.

The changes in PAD-15, used in applying for casing and tubing for wildcat wells, are designed to provide a clearer explanation of the specific well location involved and any previous exploratory work done in the surrounding area.

PAD-16, used to report inventory of unused casing and tubing in an operator's possession and the operator's drilling history and future drilling program, originally called for the 1950 drilling history but has been revised to cover the history of the four quarters immediately preceding the quarter in which the application form PAD-17 is filed.

Only a few minor changes have been made in PAD-17 and but one major change, calling for a report on the tonnages of casing and tubing needed for the maintenance and repair of existing wells.

The PAD-17DP form is a quarterly report of operators' total inventory of drill pipe on hand and requirements for new drill pipe, and has been changed only in a few details of wording.

EASTERN

Sonic Drilling Predicted

CAMBRIDGE, Mass.—"Sonic" type oil-well drilling is reported to be under development study, in a mid-year report by Harold W. Danser, Jr., president of Ultrasonic Corp. The concern, founded in 1945, deals with the development of sonic energy as an industrial tool.

"Present rotary-drilling devices in cutting through hard-rock structures must frequently be brought up from the bottom of a well for replacement by newly sharpened tools," Danser said.

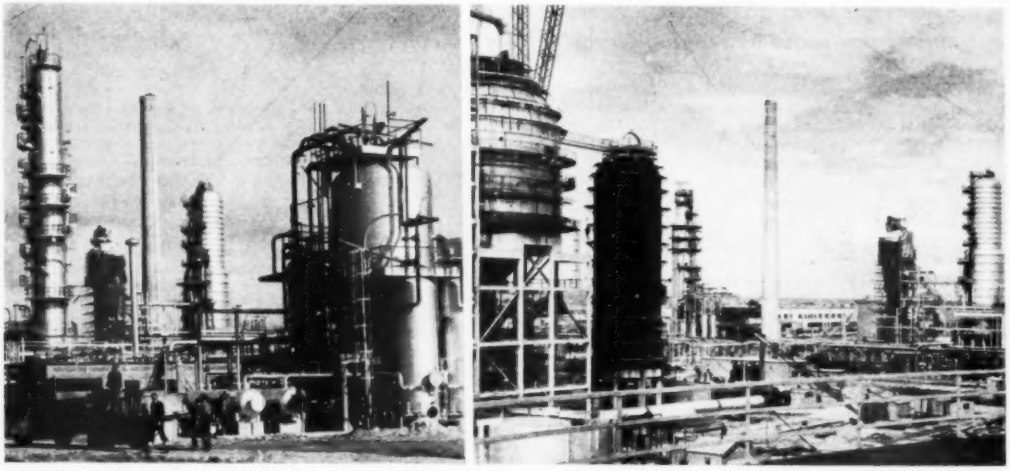
"It has been estimated that perhaps half of the billion-dollar annual expenditure in drilling oil wells in this country today reflects such nonproductive tool-replacement time.

"There are good technical reasons to believe that one of our new sound generators may be used to actuate a high frequency sonic-vibrated, nonrotary, blunt drilling tool, which would drill as effectively as a sharpened rotary drill, but which would be subject to only infrequent replacement during drilling operations, thus possibly saving the industry a large fraction of the estimated $500,000,000 now wasted in tool-replacement time."

Phoenix Oil Co. Sold

BRADFORD, Pa.—South Penn Oil Co. and Healey Petroleum Corp. have bought all outstanding stock of Phoenix Oil Co. for $924,000.

Phoenix has a current production of about 175 bbl. daily and has leases on about 1,700 acres in McKean County. The company was formed in 1891. Stock was purchased from 17 owners.



PROCESS UNITS.—In the picture at left are shown the debutanizer tower, at left, and the catalytic cracking-sweetening unit, right. At right is a general view of the Fawley crude units, seen from the roof of a storage tank. The 65,000-bbl. atmospheric unit is designed to distill Middle East crude down to about 25 per cent bottoms; the second combination atmospheric unit will give about 20 per cent residuum. Engineering of the refinery was by Foster Wheeler Corp., with design of a majority of units by Standard Oil Development Co.

Fawley on Stream

Esso Petroleum's 126,000-bbl. refinery, Europe's biggest, begins operations; Atlee will dedicate plant September 14

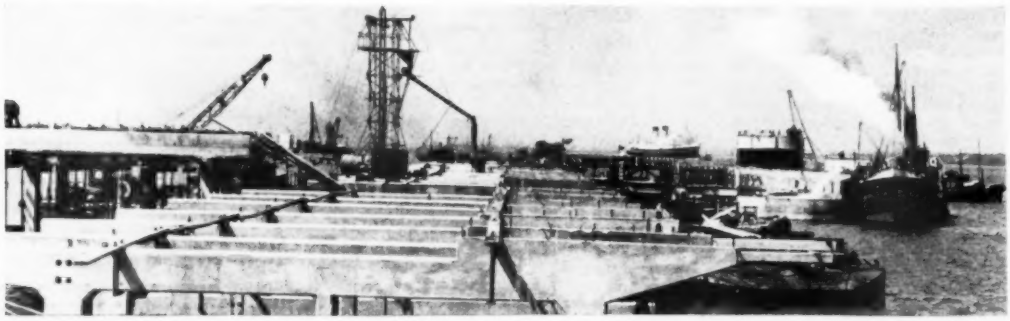
EUROPE'S largest refinery is now in partial operation at Fawley near Southampton, England. It is the new 126,000-bbl. daily capacity plant of Esso Petroleum Co., Ltd., which will be officially dedicated September 14 by Prime Minister Clement Attlee.

The refinery has been under construction more than 2 years, and its completion at this time is particularly opportune because of the shutdown of the Abadan, Iran, refinery of Anglo-Iranian Oil Co., Ltd. Its production will more than offset former British imports of approximately 50,000 bbl. of products daily from Iran.

The Fawley refinery was originally scheduled to operate in part on Iranian crude oil but other crude-supply arrangements from the Middle East have been made. The Eastern Hemisphere shortage of products resulting from the Iranian deadlock has raised the question of above-capacity operation at Fawley as at other European refineries.

The pictures shown here (Esso photographs) are recent scenes at the nearly completed refinery. Equipment includes two distillation units, one of 60,000 bbl. daily capacity and the other of 66,000 bbl. daily, a 41,000-bbl. daily fluid catalytic cracking unit, and auxiliary facilities. In the plans for the second part of the Fawley construction program are provisions for the manufacture of a complete line of lubricants.

The Fawley refinery cost about £37,500,000. It is an essential part of the British program to raise domestic refining capacity to more than 400,000 bbl. daily. The Standard Oil Co. (N. J.) organization previously had an 18,000-bbl. daily refinery at Fawley, and two thermal reforming units have been completed by revamping units in this older plant.



MARINE TERMINAL JETTY.—Provision has been made for the handling of large tankers bringing in crude oil. Berthing frontage is outside the area of other Southampton shipping.

Iraq Hits Jackpot

Government-I.P.C. oil pact sets per barrel payment 10 cents higher than in Arabia due to small pipe-line costs

Dahl M. Duff

TERMS of the new concession agreement between Iraq and Iraq Petroleum Co., Ltd., show that it obviously is an extremely favorable one from the standpoint of the government.

For the current year, the agreement provides Iraq with a total per barrel revenue equivalent to approximately 66 cents. By 1953, expanded production will give the country a per-barrel payment amounting to about 73 cents.

The high Iraqi payment, which by comparison is about 10 cents above that in Saudi Arabia f[illegible]1, is based on the more advanta[illegible]location of Iraq's principal produ[illegible]ng field, Kirkuk.

Since Kirkuk is much closer to the Eastern Mediterranean and European markets than, for example, Abqaiq in Saudi Arabia, the crude is considered to have a value in the field higher on a net-back basis by the difference in pipe-line costs.

Ministers approve. — The new agreement, which is retroactive to January 1, 1951, has been approved by the Iraq Council of Ministers and now awaits formal ratification of the country's parliament convening in September. Though the agreement has not yet been confirmed by I.P.C., a summary of its major terms was made in an official government release in Bagdad.

The Iraq-I.P.C. agreement follows the increasingly familiar pattern for major, established producing countries of a 50 per cent government participation in the company's earnings. Beyond this, there are several novel and significant features in the Iraq agreement itself.

New twists.—For the first time in the Middle East, basic royalty breaks away from the flat so-much-a-barrel rate and goes on a percentage, in-kind basis. This in effect links the government more closely to the fortunes of the oil business itself. Basic royalty is one-eighth, the same as in the United States, and it can be taken in oil or in cash at posted terminal prices.

The company has agreed to supply all crude-oil needs for products for domestic consumption at what amounts to a token price. This crude will be furnished for a new refinery which the Iraq Government itself is preparing to build.

Less the 5 per cent share held by C. S. Gulbenkian who helped obtain the original concession prior to World War I, Iraq Petroleum is owned equally by Anglo-Iranian Oil Co., Ltd.; Cie. Francaise des Petroles; Royal Dutch-Shell; and Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc.

Present production in Iraq is about 170,000 bbl. daily, the capacity of the existing pipe lines from Kirkuk to the Mediterranean. A new 30 and 31-in. line now under construction will move an additional 275,000 bbl. daily when it is completed next year.

Organization. — I.P.C. itself operates Kirkuk and the pipe lines to the Mediterranean terminals. Its affiliate, Basrah Petroleum Co., Ltd., made a major Middle East discovery in southern Iraq about 3 years ago and is preparing to begin commercial production early next year with shipments through a 55-mile line to Fao at the head of the Persian Gulf. Another associated company, Mosul Petroleum Co., Ltd., has discovered oil at Ain Zalah in northwest Iraq. Preparations are being made to transport oil to the K-2 pipe-line station.

Under the agreement, provisions of the three Iraq concessions are unified with the three areas considered together in the division of profits. Formerly the Basrah and Mosul concessions carried terms different from Kirkuk, providing for a 20 per cent in-kind oil payment plus four shillings gold per ton on the remainder.

Financial provisions. — The financial provisions of the new Iraq agreement operate as follows: Iraq gets a standard one-eighth royalty of the total oil exported. This it may sell to third parties or require the companies to buy at posted terminal prices. Income taxes are then levied to bring the government's total take, including the royalty, up to a sum equal to 50 per cent of the total company profits within Iraq.

A minimum revenue is guaranteed Iraq. If in any year the 50 per cent of the profits is less than the equivalent of 25 per cent of the value of the I.P.C. and Mosul production and 33⅓ per cent of the Basrah crude at posted terminal prices, then the companies will pay the government a sum sufficient to bring the government's total revenue up to this amount. This is a special payment which would be called for only if there were a sharp drop in production or world-oil prices.

According to the official announcement, Iraq's total revenue from oil will be: in 1951, about $42,000,000; in 1952, $64,400,000; in 1953, $126,000,000; in 1954, about $145,600,000; and in 1955, about $165,200,000. These figures, of course, are based on contemplated future levels of production, including Basrah and the new 30-in. Kirkuk-Mediterranean line.

Complication.—One complication to a profit-sharing arrangement between I.P.C. and the government has been the fact that the company operates on a nonprofit basis. The crude is taken by the owning companies at cost-of-production plus one shilling.

The company's profit, and that of its two Iraq affiliated companies, will be determined by taking the computed value of its entire exported production at the Iraq border and deducting from this the agreed costs. The parent companies probably will establish subsidiaries in Iraq which will make the necessary tax payments to the government as provided in the agreement. Such arrangements leave undisturbed existing-basis agreements among the I.P.C. parents.

Of importance to Iraq is the fact that its 50 per cent share of profits is figured before any deductions are made for foreign taxes. Provisions for tax credits for foreign taxes paid vary considerably in the countries in which the several I.P.C. parents are incorporated.

I.P.C. has agreed that in the absence of circumstances beyond its control, minimum production will be 22,000,000 tons annually (about 440,000 bbl. daily) by I.P.C. and Mosul beginning in 1954, and 8,000,000 tons annually (about 160,000 bbl. daily) by Basrah Petroleum from 1955. Subject to the same conditions, the company also has promised Iraq a minimum total revenue of at least $56,000,000 in 1953 and 1954, and $70,000,000 in 1955.

Other features.—Other features of the agreement include a provision for two Iraqi directors on the board of directors of the three concession-holding companies. These men, presumably nominated by the government, will participate in the company management in London.

The crude oil which I.P.C. will supply for the government refinery will be delivered at Baiji which is near Station K-2 and the Tigris River crossing of I.P.C.'s Mediterranean pipe-line system. The government will pay the equivalent of about 10 cents a barrel for this oil.

The government refinery is to be built near Baghdag and is under contract to M. W. Kellogg Co. The 120-mile connecting pipe line from Baiji will be built by the government. Pipe has been contracted from Stewarts & Lloyds in England. A capacity of 24,000 bbl. daily has been reported as planned for the refinery.

Provision for increases. — Should a higher rate per-ton revenue agree-

ment be negotiated in a neighboring Middle East country, Iraq is entitled to request similar treatment from I.P.C. This point obviously refers to Iran.

However, oil men point out there can be no basis for comparison between a company-government partnership and a nationally-operated undertaking, and further that there are fundamental factors calling for different concession terms in each oil country. Nevertheless, the assurances given Iraq regarding consideration to higher agreements will probably allay political criticism within the country. There has been some pressure on the Iraq Government to hold up a final settlement with I.P.C. until the outcome of the oil issue in Iran.

The official announcement of the new Iraq agreement made no mention of the former dispute between the government and the company over whether the previous 4-shilling gold royalty per ton should be paid at the free-market or the official rate. However, the agreement provides that the companies will, on ratification, make a special one-time payment of £5,000,000 sterling to satisfy financial obligations under the old concessions. These obligations include royalty and tax-commutation payments, government-inspection expense, telegraph, telephone, and radio licenses, and expenses for the training of Iraqis in England.

More Iraqi employes.—As a result of the new agreement, I.P.C. is committed to take an increasing number of Iraqi nationals into its operations. At their own expenses, the I.P.C. companies will maintain 50 Iraqi students in foreign universities studying oil subjects and will establish an oil-technical school at Kirkuk with a capacity of 240 Iraqis students and graduating 60 a year. The students maintained abroad will be in British and probably also American schools.

Iran Holds Out

Government rejects "best" British offer; collapse of negotiations seems imminent despite Harriman efforts

THE fate of the Iranian oil negotiations hung in precarious balance early this week after Iran's representatives rejected the final and "best" offer of the British delegation.

Desperate efforts were being made by W. Averell Harriman to avert complete collapse of the negotiations. He was reported to have told the Iranians that the new British offer was a proper basis for discussion and reiterated that they could expect no help from the United States in marketing their oil.

The head of the British delegation said that, if his proposals are completely refused, he would return to London and the British technical staff at Abadan definitely would leave. Despite the uncompromising position of the Iranians, another conference was scheduled, and publication of the formal rejection was delayed.

The "straightforward, commercial proposition" which Britain made to the Iranian Government last week, provided in effect that the British would market the oil and assist in the operations in return for a half share of the profits.

The eight-point offer advanced by Richard Stokes, chief of the British negotiating team now in Teheran, proposed that a new British organization handle Iranian oil exports under a 25-year contract and that it split the profits from this arrangement with the Iranian national oil company. Actual operations would be under a management agency acting on behalf of the state oil company.

This was the proposal which the Iranian Government rejected. With the discussions thus dangerously close to a complete breakdown, Harriman, President Truman's personal representative, came back on the scene with an appeal to the Iranians to at least give consideration to Stokes' plan. Iranian officials took the firm position they would not accept any agreement which would allow Britain to resell Iranian oil at a profit.

At loggerheads.—In view of these developments, there was increasing pessimism that the second negotiating effort would fail altogether. If this happens, an indefinite shutdown and consequent deterioration of the properties seems unavoidable. Last month's attempts of the Iranian "take-over" mission to dispose of the production on the world market were wholly unsuccessful, and there is no reason to believe any different result could be attained later.

The Stokes plan was described as an "umbrella" under which a full settlement of the nationalization issue might be found. The British official said the terms were "as good as Iran will ever get from anybody." The proposal had the support of Harriman, and in Teheran there were persistent reports that the real author of the plan was Walter J. Levy, New York oil consultant who has been with Harriman as an adviser.

The Stokes offer was subjected to increasing attack both in and out of the Government.

Tanker contribution.—The principal British contribution under the Stokes proposal would be the services of the large-tanker fleet and world-wide marketing facilities of Anglo-Iranian. This is a necessary prerequisite to large-scale operation of the Iranian industry. No other large international company with the necessary facilities will participate in handling oil from an expropriated enterprise, and the only possible outlets would be the so-called "fringe" buyers in the industry.

The purchasing organization to be set up by the British would buy both crude and refined oil f.o.b. southern Iran from the Iranian company. Iran could make other sales provided the interests of the purchasing organization are protected. This presumably refers principally to Iran's threat of cut-rate oil sales. The purchasing organization would buy from Iran at world prices less a reduction generally equal to profit made by the Iranian national company after the reduction, thus in effect a 50-50 profits division.

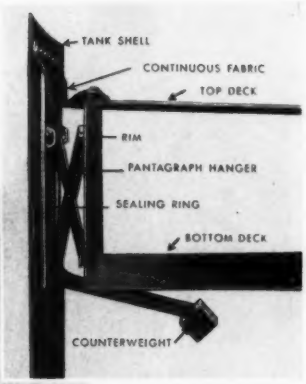
The Stokes plan also provided that Anglo-Iranian's assets in Iran would be transferred to the national company with provisions for compensation. Kermanshah Oil Co., the A.I.O.C. subsidiary which produces and refines for internal consumption in Iran, also would be transferred to the Government under favorable terms.

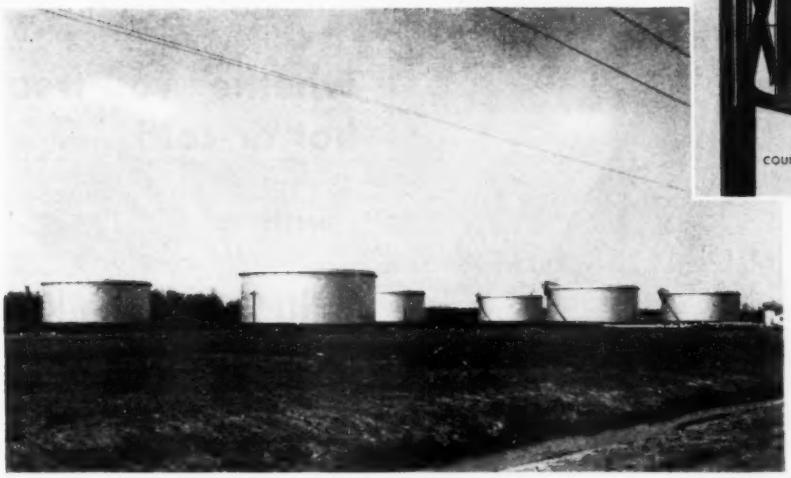
Joint agency.—It was explained that the purchasing organization would have to be assured of a continuing supply of Iranian oil for its customers. Therefore, for the actual operation of the fields and refinery and other installations, the purchasing organization and the Iranian national company would together form a joint agency which would manage exploration, production, refining, and loading of the oil under authority of the state concern. Iranians would be represented on the board of this management agency, and non-Iranians would be hired only when necessary.

Negotiating points.—On their side, the Iranian Government officials said that there could be only three points open for discussion in the negotiations. They are: Sale of oil to Britain for its own needs; British claims for compensation for the properties; and arrangements to continue the services of the present British technical staff.

In connection with the British claims for compensation for the nationalized properties, Iran was reported to be ready to raise counterclaims amounting to the equivalent of more than $280,000,000. These were based on Anglo-Iranian's sales to the British Admiralty and Air Force at below-market prices, charges for unpaid taxes on products supplied to Allied forces during the war; and Iran's contention it is due all income from the sale of oil after

Improved *Horton Seal*





Guards Against Evaporation

Illustrated in the above view are six of the eight 110-ft. diam. by 48 ft. oil storage tanks we recently erected at the Mid-Valley pipe line station near Mayersville, Miss. All eight tanks are equipped with Horton Double Deck Floating Roofs with the improved Horton Seal.

The Horton seal is one of the many benefits you obtain with all Horton floating roofs. Improvements like this seal are typical of the advantages you get when you place your confidence in our design, erection and fabrication facilities.

Here is how the improved Horton Seal (shown above in cross section) helps solve your evaporation problems and at the same time reduces corrosion and fire hazards:

- A continuous sealing ring fits snugly around the the interior of the tank shell. Because the sealing ring is at all times in close contact with the shell, no secondary seal is needed.
- Pantagraph hangers which support the sealing ring, exert a gently outward pressure to keep the roof centered at all times. The pantagraph hangers are designed to last a long time, even under corrosive conditions and to provide dependable, trouble-free operation.
- Fabric Seal. A gastight, weatherproof fabric effectively seals the annular space between the top of the sealing ring and the floating roof.

For your next storage facilities why not assure yourself of that extra margin of quality and profit by specifying Horton Floating Roofs with the improved Horton Seal. Remember that the combination of Horton Floating Roofs and the Horton Seal means long term economy because it cuts vapor loss and reduces corrosion and fire hazards.

All three types of Horton Floating Roofs—the Double Deck, Pontoon and Pan—are equipped with the improved Horton Seal. Here is the secret to efficient vapor-saving storage of valuable petroleum hydrocarbons. Let it work for you.

Write our nearest office today for further details. There is no obligation on your part.

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Birmingham, 1.....1536 North 50th St.
Boston, 10.....1025-201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615—1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 4.....1554—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.
Washington 6, D. C.....1139 Cafritz Bldg.

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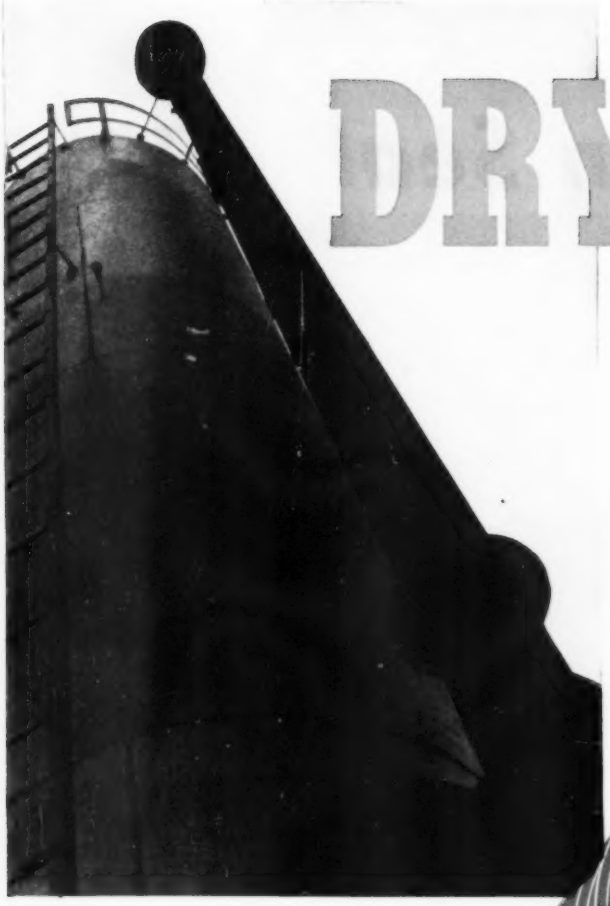

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March 20, date of the nationalization law.

Iran was said to be preparing to demand 20 per cent of the difference between world prices and those at which the company made sales to the British Admiralty and Air Force.

Israel Buys British Line

The Israeli Government has been named as the buyer of the 130-mile products pipe line laid 2 years ago in East Africa as a part of a British agricultural development project.

The use to which the Israeli will put the 6-in. line is not known, though it was believed it probably will become a part of irrigation development in Israel. Israel is paying $700,000 in United States money for the line which cost some £400,000, or $1,120,000.

It will be the second move for the pipe. When Shell Petroleum Co. laid the line as agent for the British Overseas Food Corp., the pipe was obtained in India, where it had been used on a wartime line.

Lebanon Refinery Planned

California-Texas Oil Co., Ltd., has disclosed plans for the construction of a refinery near Sidon, Lebanon, western terminus of the Trans-Arabian pipe line.

The plant will be constructed and operated under an agreement with the Lebanese Government. Diesel and fuel oils will be produced for local consumption in Lebanon and for Caltex bunker requirements only.

Total estimated cost is $5,800,000 to cover purchase of land and construction of the projected 13,000-bbl. plant. The project is scheduled for completion in about 24 months.

AUSTRALIA

New Refinery

Standard-Vacuum plans third Australian plant

ANOTHER 12,000 bbl. of additional refining capacity is in prospect for Australia with the announcement by the Standard-Vacuum Oil Co. organization of plans for the construction of a complete new plant at Altona, near Melbourne in Victoria.

It is the third large refining project announced for construction in Australia in recent months. In April Shell said it would build a refinery at Geelong, Victoria, which will have an ultimate capacity of about 20,000 bbl. daily. Caltex last month disclosed it is studying various locations for the construction of a refinery in Australia of 20,000 bbl. daily capacity or larger.

Standard-Vacuum's Australian affiliate, Vacuum Oil Co., Pty., Ltd., expects to spend approximately $17,000,000 on the Altona project. At the present time, the company operates a 2,000-bbl. lubricating-oil and asphalt refinery at Altona which was completed in 1949.

Including the projected 10,000-bbl. daily refinery at Durban in South Africa, the new Australian refinery will bring Standard-Vacuum's total processing capacity to approximately 100,000 bbl. daily. The company's largest plant is the 64,000-bbl. daily capacity refinery at Sungei Gerong in south Sumatra.

All three Australian projects indicate an ultimate increase of at least 52,000 bbl. daily in refining capacity in the commonwealth. Present capacity is about 18,000 bbl. daily in five plants. Present refining companies are Commonwealth Oil Refineries, Ltd., jointly owned by the Australian Government and Anglo-Iranian Oil Co., Ltd.; Shell; Bitumen & Oil Refineries (Australia), Ltd., in which Caltex has a minority interest; and Vacuum Oil.

LATIN AMERICA

State Takes Over

De Mares concession dies "natural death" Saturday

THE 1,280,000-acre De Mares concession, Colombia's largest oil property, formally passes to government ownership this week.

Except for possibly different signs and new occupants of some of the key offices, there will be little physical change August 25 when Tropical Oil Co.'s 30-year concession contract comes to an end. As stipulated in the original agreement, all fixed property reverts to the Government.

Empresa Colombiana de Petroleos, organized under terms of a 1949 law dealing particularly with De Mares, takes over the concession as the instrumentality of the Government. Tropical's parent, International Petroleum Co., Ltd., a Standard Oil Co. (N. J.) subsidiary, has leased the Barrancabermeja refinery and is furnishing personnel to assist with the field operation.

The Empresa and Tropical have arranged a celebration marking the event. A number of guests will be flown to De Mares for the reversion at which time the Government will formally receive the concession and transfer it to the Empresa, which will then execute the lease contract with International.

De Mares produces more than 40,000 bbl. daily of crude and condensate and has reserves which the Colombian oil minister recently said approximate 108,000,000 bbl. Using a $10,000,000 loan from International and $14,000,000 in other funds, Empresa plans modernization and expansion of the refinery to 35,000 bbl. daily. A preliminary agreement on the project was made with Foster Wheeler Corp. by Luis E. Sardi, Empresa manager, during a recent trip to the United States. Under its 10-year lease, International will use the plant and pay a per-barrel fee plus depreciation charges.

The De Mares concession was originally granted in 1906. It was purchased by the Benedum and Trees interests in 1916. The discovery well was brought in in 1918, and 2 years later, Tropical was sold to International. The question as to when the 30-year term of commercial production actually began was finally fixed by the courts as August 25, 1921.

Production reached a peak in 1940 with nearly 59,000 bbl. daily. The outlet is provided by the refinery and by the 10 and 12-in. Andian National Corp., Ltd., pipe line to the Caribbean. Andian, affiliated with International, operates its line under a 50-year concession which does not expire until 1973.

Aruba Workers Return

The working force at the Aruba, N.W.I., refinery was virtually all back on the job last week after a walkout that resulted in a partial shutdown for nearly a week.

The plant, largest in the Western Hemisphere with its capacity of 450,000 bbl. daily, was expected to be back at normal throughput early this week, though there have been operational difficulties with the cracking unit not connected with the strike.

It was believed the loss of products as a result of the strike totaled about 1,000,000 bbl., most of which was heavy fuel and distillate. It was felt a substantial part of this will ultimately be made up since crude production continued in the meantime. The refinery is supplied with crude from nearby Venezuela.

Lago Oil & Transport Co., Ltd., Standard Oil Co. (N. J.) affiliate, made a settlement of a 16.1 per cent pay increase to end the strike. The refinery force numbers about 3,500.

International Briefs

Exploration work of Bahamas Exploration Co. in British Honduras has been halted by the rainy season, according to reports from Belice. Results through the past year have been satisfactory and the company reportedly is considering drilling a test well this autumn.

Independent oil interests from Houston and Fort Worth have been negotiating with the Guatemalan government for oil exploration rights in that republic, according to reports from Guatemala City. The United States interests were not identified.

PERSONALS

Steps Up

Mackenzie heads Imperial western producing division

W. D. C. MACKENZIE, assistant manager of Imperial Oil Co.'s western producing division for the past 3 years, has been appointed manager of the division to succeed R. B. Curran, who has resigned.

A native of Macleod, Alta., Mackenzie graduated from the University of Alberta in 1935 with a B.Sc. degree in mining engineering. The following year he joined Imperial's geological department at Calgary.

In 1937 he took charge of subsurface geological work in Turner Valley field and later was transferred to the petroleum-engineering department there.

In 1942 he joined the Canol project working with the United States Government. After the war he became chief engineer of the company's producing department and in 1948 was appointed assistant manager of the western producing division.

Gentry Lee, who was recently made chief counsel of Cities Service Oil Co., has been elected a director of the company. For several years he was engaged in private practice in Tulsa, specializing in petroleum work.

Donald M. Davis has resigned his position with Union Oil Co. of California and has opened consulting offices in Los Angeles. Prior to this, Davis was geologist for Richfield Oil Corp., before joining Union.

Charles R. Dodson has joined Stanley & Stolz, consulting engineers and geologists, Los Angeles. Dodson will continue to be professor of petroleum engineering at the University of Southern California.

H. L. Popenoe, Jr., geologist for Shell Oil Co. at Ventura, Calif., sailed for The Hague last week where he will spend the next 6 months. **Lloyd Lewis,** geologist in the Los Angeles area offices, was en route home after spending 6 months there.

Warren Spaulding, formerly with the geological departments of Petroleum, Inc., and Gulf Oil Corp. in Kansas, has joined the geological staff of Anderson-Prichard Oil Corp. in Wichita.

William J. Warren has joined the staff of Shell Development Co. and has been assigned to the associate directors' staff. He was formerly professor of electrical engineering at University of Santa Clara.

J. T. Grady, formerly of Wichita, Kans., has been promoted to production superintendent of The Texas Co., and transferred to the Salem, Ill., office.

Glenn Marrs, formerly with Sunray Oil Corp. at Yorktown, Tex., has joined Cooperative Refinery Association at Kansas City, Mo., as production engineer.

William H. White, formerly geologist with The California Co. at New Orleans, has joined Pan-Am Southern Corp. as district geologist. He will open geological offices for the firm at Lafayette, La., to cover the Louisiana Gulf Coast area. Prior to his service with the California company he served as assistant geologist in the Tennessee geological department. **John E. Brewster,** formerly assistant manager of the firm's crude-oil purchasing department, has been made manager of that department. Brewster will continue to maintain offices at Shreveport, La.

George M. Chinery, chief estimator in the engineering department of Tide Water Associated Oil Co.'s Bayonne, N. J., refinery, has been named to the newly created post of chief planner for the plant's mechanical department. He will direct the planning of all mechanical work at the refinery. **Arthur Dundas** was advanced from senior estimator to chief estimator of the engineering department. **George Rohrman,** formerly a draftsman in the engineering department, was promoted to the new position of turnaround planner with the mechanical department.

John S. Sparks, Jr., assistant oil editor of the Fort Worth Star-Telegram, has resigned to become public-relations assistant of the Independent Petroleum Association of America at Washington, D. C. He replaces the late Lawrence E. Smith, who died early in the year.

T. A. ATKINSON

Thomas A. Atkinson has been named assistant production manager of Rocky Mountain operations for General Petroleum Corp. He first joined the firm in 1926 while still in high school and held intermittent jobs while attending University of California, from which he received his degree in 1933. In 1944 he was named assistant to the southern division superintendent of the production department. Since 1947 he has been in industrial-relations work. **Edward S. Hochuli** succeeds Atkinson as manager of the corporation's industrial-relations department.

Otto Hackel has been placed in charge of a new geologiical office opened by Independent Exploration Co. at Santa Paula, Calif.

Harry A. Miller, Jr., has resigned his job in the geological department of Ohio Oil Co. at Midland, Tex., and has joined Hancock Oil Co. of California's geological department. He will be stationed at the firm's Mid-Continent division headquarters in Midland.

R. M. Acher, field foreman for The Texas Co. at Maysville, Okla., has been transferred to Wichita and promoted to assistant district superintendent.

W. L. Barksdale, formerly geologist with Gulf Oil Corp. at Durango, Colo., has joined the firm of Dunn & Boreing at Denver.

T. W. Lang has resigned as crude-oil buyer for Sohio Petroleum Co. and is operating independently at Evansville, Ind.

D. W. Hovey has resigned as president and general manager of Danaho Refining Co. to become an independent operator at Houston. **Raymond P. Elledge, Jr.,** succeeds Hovey as president. **C. W. Curtis,** formerly with Independent Refining Co. at Arp, Tex., and more recently with Scurlock Oil Co. at Houston, has been appointed general manager of the firm.

PERSONALS

Dan D. Hollar, for the past several years in the geological department of Derby Oil Co., will become manager of the new geological and land office that will be opened by E. K. Carey Drilling Co. in Wichita on September 1.

E. E. Barberii, instructor in production engineering at the University of Tulsa, has accepted an assignment as adviser to Petroleos Mexicanos for an indefinite period. He will be connected with the oil-development section of Pemex headed by **A. Barnetche.**

C. L. Tucker, district superintendent of Hunt Oil Co. for East Haynesville, La., operations, has resigned to join Natural Gas & Oil Corp. of Shreveport, La. He will be headquartered at Bossier City, La., and will be in charge of drilling and production on Barksdale Air Force Base, where an active campaign is being started. **H. P. Watts,** assistant to Tucker at Haynesville, has been named to replace Tucker.

Earl A. Brown has been appointed general counsel of Magnolia Petroleum Co. and Magnolia Pipe Line Co., succeeding the late Walace Hawkins. Brown, who graduated from the law school at University of Texas in 1914, joined the firm's legal staff at Oklahoma City in 1936. After 3 years he was transferred to the firm's general offices in Dallas as assistant general counsel.

Charles R. Wallen, acting division superintendent of the Oklahoma-Kansas division of Continental Oil Co., has been promoted to superintendent of the newly established Oklahoma division at Oklahoma City. He will be in charge of the company's operations in Oklahoma. The separate Oklahoma production division has been established as a result of the firm's expanding production operations in the state. Others who have been transferred from the Oklahoma-Kansas division to the new division include: **V. R. Govett,** division chief clerk, and **C. V. Burk,** mechanical engineer, in the same capacity. **G. C. Clark,** central regional manager of exploration at Oklahoma City, has been promoted to assistant to the regional general manager, and **W. C. Hawk,** assistant regional geologist, has been named to succeed Clark. Headquarters for both will continue to be in Oklahoma City. **H. D. Christner,** district petroleum engineer at Rincon, Tex., has been promoted to division petroleum engineer of the new division.

W. H. Pattison, of Wichita, and **Kenneth Webb,** consulting geologists, will open and share offices at Sterling, Colo., on September 1.

Jack Small has resigned as geologist for Calvert Drilling, Inc., at Olney, Ill., to be an independent consultant at Mount Carmel, Ill.

Mac Donald Oliver, Jr., formerly with the consulting engineering firm of Cable & Stine, has joined San Juan Oil Co. at Dallas as chief engineer. Others who have recently joined the firm include: **V. B. Harris,** formerly petroleum engineer for Harper-Turner in Oklahoma City, chief production engineer; **Harold Eugene Wright,** formerly West Texas district engineer for Hiawatha Oil & Gas Co., production engineer; and **R. W. Russell,** formerly an exploitation engineer for Shell Oil Co., development engineer.

J. E. Gray, formerly of Centralia, Ill., has been appointed division production manager of Shell Oil Co.'s newly created Rocky Mountain division office at Denver. Formerly called the Rocky Mountain district office, it was promoted to division status. **J. W. McDonald** will be division geologist; **R. H. Miller** will be division production foreman; **E. H. Shields** was named drilling foreman; **A. H. Weider,** division exploitation engineer; and **F. R. Versaw** will be the new geophysicist.

Dr. S. K. Chakravorty has been appointed principal geologist in Saskatchewan's Department of Natural Resources and will be in charge of the newly established petroleum-geology and engineering division of the Mineral Resources Board. The work of this new division will include administration of conservation regulations and practices in connection with exploratory drilling and the production of oil and gas as well as geological studies of the sedimentary areas of Saskatchewan.

John A. Bolt, assistant superintendent of technical service in the Standard Oil Co. (Ind.) research laboratory at Whiting, Ind., has been promoted to division director, light oils and special products. He succeeds **Dr. P. C. White,** who has become manager of research and development for Pan American Refining Corp. at Texas City, Tex. **H. M. Hart,** group leader in the research laboratory at Standard's Sugar Creek, Mo., refinery, has been promoted to assistant superintendent of technical service at Whiting.

Frank E. Johnson, formerly process engineer with Cities Service Refining Corp. at Lake Charles, La., has joined Phillips Petroleum Co.'s research and development department at Bartlesville, Okla., as process engineer.

W. M. Capps, engineer for Amerada Petroleum Corp., has been transferred from Seminole, Tex., to Tulsa.

Albert E. Sweeney, Jr., director of the Interstate Oil Compact Commission's secondary-recovery division at Oklahoma City, has been given a 2½-month leave of absence to go to Caracas, Venezuela, as consultant to the government on reservoir engineering. He will leave for Venezuela immediately following the commission's summer meeting in Fort Worth September 10-11. Sweeney, who is going at the request of **Dr. Santiago E. Vera,** Venezuelan minister of mines and hydrocarbons, will make special studies of oil recovery in Venezuela with respect to the most efficient program for increasing ultimate recovery.

A. E. SWEENEY

Eugene S. Pennebaker, Jr., senior petroleum engineer in the Houston office for Humble Oil & Refining Co., has been transferred to Corpus Christi, Tex. Other transfers include: **Ralph K. Hill,** petroleum engineer, from the Gulf Coast division office to Houston as senior petroleum engineer; **Charles D. Enrhardt, Jr.,** petroleum engineer, from Friendswood, Tex., district to Houston as senior petroleum engineer; **Norman A. Nelson,** senior petroleum engineer, from Houston to the Friendswood district; **Samuel T. Sikes, Jr.,** supervising petroleum engineer, from Houston to the Gulf Coast division office; **Jeremiah Ward, III,** senior petroleum engineer, from the Gulf Coast division office to the East Texas division office at Tyler, Tex., as supervising petroleum engineer; **Willis P. Orr,** senior petroleum engineer, from Houston to the Hawkins district, East Texas division; **J. D. Nelson, Jr.,** compressor-plant foreman at Stratton, Tex., to the Pickton, Tex., gas plant as plant superintendent; **William Thiebaud,** tool pusher, from the Winters district, North Texas division, to the Avoca, Tex., district as assistant district superintendent; **F. L. Lively,** assistant district superintendent, from the Mallalieu, La., district to the North Crowley district; **J. C. Andries,** assistant district superin-

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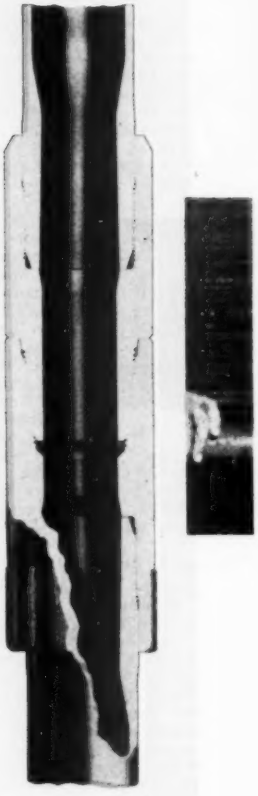

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"In my opinion, tool joints must satisfy three requirements: they must be strong and safe, they must be long lasting, and they must be easy and economical to replace. **REED** Super Shrink-Grip Tool Joints meet all these requirements so well that I'm using them on my rigs."

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PERSONALS

tendent, from the North Crowley district to the Bayou Sale, La., district; **H. Durst, III,** assistant district superintendent, from Bayou Sale to Mallalieu; **Delma Baucum,** assistant superintendent at Snyder, Tex., transferred to Wink, Tex., as district superintendent; **C. M. Boatman,** assistant district superintendent, from Hobbs to McCamey; **C. C. McNeil,** assistant district superintendent, from Wasson to Odessa, Tex.; **W. A. Watson,** assistant district superintendent, from Odessa to Snyder; and **A. J. Shaw,** from farm boss at Hobbs to Wasson as assistant district superintendent.

P. M. McFadden, assistant district superintendent at McCamey, Tex., for Humble Oil & Refining Co., has been promoted to district superintendent. **J. P. Baldridge,** farm boss at Hobbs, N. M., has been promoted to assistant district superintendent.

Hudie H. Barber has been promoted from assistant foreman to production foreman in the Jackson, Miss., area of Magnolia Petroleum Co.'s Shreveport, La., producing district. **Howard W. Shields,** assistant foreman in the Salem, Ill., producing district, has been transferred to the Electra, Tex., district and promoted to production foreman.

Sunray Oil Corp. has reorganized its production department to decentralize activities so as to allow a more flexible operation. It has created operating districts within the Mid-Continent division, and each district is headed by a district superintendent. As of September 1, superintendents at the following offices include: **A. E. Hoffman,** acting superintendent of the Corpus Christi district; **Keith Lindley,** superintendent at Midway, Ark.; **C. E. Wilson,** superintendent at Alice, Tex.; **A. E. Hoffman,** superintendent at Lake Charles; **C. D. Baker,** field superintendent at Premont, Tex.; **J. R. Myrick,** field superintendent at Placedo, Tex.; **J. A. Parry,** field superintendent at Hebbronville, Tex.; **Perry A. Gill,** superintendent at Midland, Tex.; **L. E. Pruitt,** field superintendent at Odessa, Tex.; **C. C. Brunton,** field superintendent at Forsan, Tex.; **A. S. McQuiston,** field superintendent at Hobbs, N. M.; **C. C. Shreve,** superintendent at Great Bend, Kans.; **Orville Hilbert,** field superintendent at Burrton, Kans.; **W. D. Poe,** field superintendent at Bushton, Kans.; **Alvin R. Summers,** superintendent at Oklahoma City; **I. T. Simmons,** field superintendent at Oklahoma City; and **R. R. Rothrock,** field superintendent at Barnsdall, Okla. **C. A. Daugherity** will be group foreman at Thermopolis, Wyo., and **Gene Heath** will be group foreman at Aztec, N. M.

Dorman D. Day, district engineer of Magnolia Oil Co.'s Kermit, Tex., district, has been promoted to assistant superintendent of the Vanderbilt natural-gas district with headquarters at Vanderbilt, Tex.

R. M. Carter, mechanical engineer for Shell Oil Co. at Hobbs, N. M., has been transferred to Midland, Tex., as drilling engineer. **J. D. C. Hogan** has been named seismologist in the Midland area office. Other transfers in the firm include: **C. A. Cox,** production foreman, from McCamey to Monahans, Tex.; **C. L. Herold,** area geologist, from Houston to Midland; **F. Janes,** head roustabout, from Wink to Odessa, Tex.; **H. G. Starling,** production foreman, from Monahans to Hobbs; **J. A. Wanamaker,** drilling engineer, from Midland to Hobbs as mechanical engineer; and **H. M. Fritts,** exploration manager for the Midland area, transferred to the firm's head office in New York City. **M. L. Pierce,** head roustabout at Monahans, has been named production foreman there.

J. C. Kern, Jr., geologist handling the Carlsbad, N. M., district for Standard Oil Co. of Texas, has been transferred to Midland, Tex., as district geologist. He replaces **R. S. Bogardus** who resigned to become district geologist for Republic Natural Gas Co. in Midland. **R. H. Dubitsky** replaces Kern at Carlsbad. **G. R. Chenot** is district geologist for Standard's Ozona, Tex., district, and **H. N. Frenzel** is district geologist for the Pecos, Tex., district. New members added to the geological staff include: **W. J. Witt, Jr.,** at Carlsbad; **J. D. Lomax** at Ozona, and **W. O. Galloway** at the Midland district. **M. E. Merriman, H. P. Butler,** and **C. V. Moore** have joined the Pecos district.

DEATHS

William E. Arthurs, 74, Rouseville, Pa., drilling contractor and producer, died August 10 at Oil City, Pa.

Albert Lawson, who was engaged in oil property enterprises in Oil City, Pa., died August 9 in Boston.

Frank Marchant, 57, well-known Michigan driller and wildcatter, died at Mount Pleasant, Mich., August 6.

George W. Scott, 57, one of the founders of Freeman Oil Co., died from a cerebral hemorrhage at Mount Pleasant, Mich., August 11.

William Glenn Butler, 44, former Continental Oil Co. comptroller, died at Seymour, Tex., August 15. Butler left his position with Continental at Houston when he suffered a heart attack about a year ago.

Jess L. Woodruff, 50, widely known Dallas independent oil operator, died August 15 at Ennis, Tex., as result of injuries he received in an automobile accident.

Adolph A. Geyer, 63, owner of Geyer Oil Co., Dallas, died there August 15.

James M. Floyd, 50, Lone Star Gas Co. advertising director, died August 10 at Dallas.

George L. Gollands, 66, executive with McMillan Petroleum Corp.'s Long Beach, Calif., refinery, died there August 11. He had spent the last 25 years in the California oil industry.

Earl B. Kendrick, 54, assistant general sales manager for Socony-Vacuum Oil Co., Inc., at Kansas City, died there August 8 of injuries suffered in an automobile accident.

Sol H. Kauffman, 71, retired member of the legal staff of The Texas Co., died in Tulsa August 14. He had retired in 1946 after 25 years' service with Texaco.

Luke Sims, Sr., 82, veteran Texas oil operator, died August 9 at Fort Worth. He was president of Fields-Sims Co., Inc., for 20 years.

Frank B. Walsh, 56, safety engineer for Humble Oil & Refining Co. at Corpus Christi, Tex., died August 12 at Houston.

James Francis McKinney, 56, superintendent for Stanolind Oil & Gas Co., died at Bay City, Tex., August 14.

Wilber Judson, 70, senior vice president and director of Texas Gulf Sulphur Co., died August 9 at Newgulf, Tex.

Henry Wertella, 68, southern California oil man, died August 13 at Torrance, Calif. He had owned and operated wells in that area for many years.

Charles J. Fox, 55, draftsman for Service Pipe Line Co. at Tulsa, died August 19 of a heart attack while on a fishing trip at Grand Lake. He was formerly an engineer and draftsman in the Tulsa office of Shell Oil Co.

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The C_Q Method enables you to select control valves conveniently — with an accurate analysis of comparative value. First, set a standard of quality; then evaluate *all* the quality factors in relation to your standard. The sum of the value of the quality factors is the C_Q (Quality Coefficient).

"It isn't the first cost — it's the upkeep" is true of control valves. The over-all cost — the real cost — includes maintenance and operation delays in addition to the purchase price. Thus, among comparably priced valves the best buy is the one with a high C_Q — because for comparison purposes

$$\text{Real Cost} = \frac{\text{Price}}{C_Q}$$

"A high quality product provides accurate performance over a long period with a minimum of maintenance and operation delays."

In other words, it has a high C_Q. Use the C_Q Method in selecting *your* control valves.

*This analysis of the valve body assembly is only half the story; write for your copy of an analysis of the diaphragm motor.

Check For These Quality Factors in the Body Assembly

Performance Factor

Flow Characteristics Correct for the Service
Alignment of Parts for Positive Operation and Response
Friction Minimized by Design of Guides, Stuffing Box, Packing, and Plug Stem Finish
Large Body Flow Passage Areas
Long Valve Stroke
C_V (Flow Coefficient) Rating

Mechanical Construction Factor

Strength of Bonnet Construction
Precautions against Seat Ring Distortion
Valve Plug-to-Stem Fastening
Guide Design for Strength and Service Life
Precautions against Misalignment of Parts
Flange Gasket Design
Lubricator Design for Efficiency, Strength, Safety
Stuffing Box Assembly Design
Strength of Bonnet and Blindhead Bolting
Availability of Suitable Body and Trim Design and Materials for the Service
Ability to Withstand Rough Handling

Convenience Factor.

Choice of Body and Trim Materials
Selection of Standard Valve Plug Types
Availability of Standard Reduced Capacity Trim Design
Choice of Standard Packing Materials
Availability of Variety of Bonnet Designs
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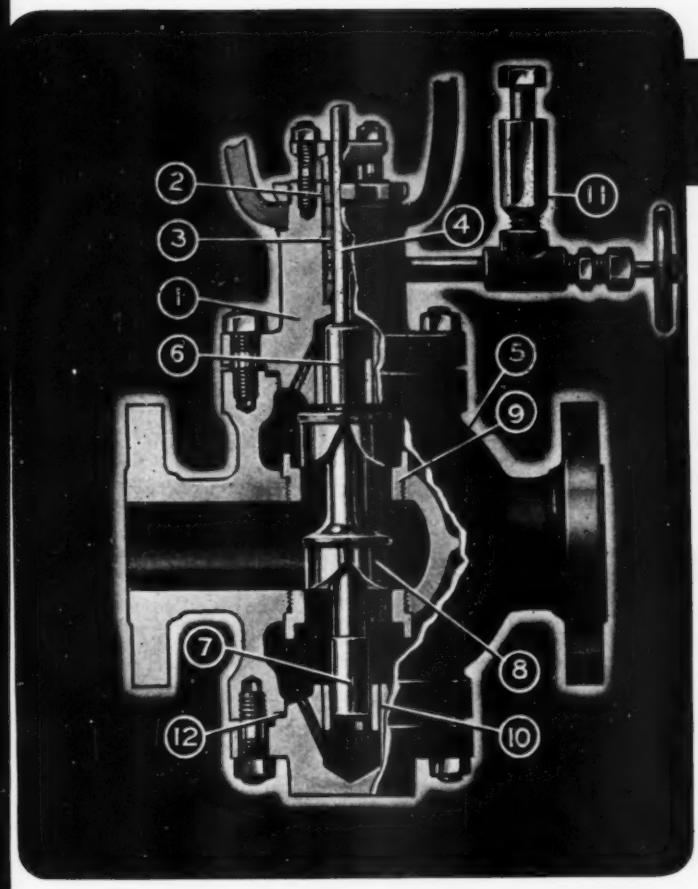
Ease of Detaching Diaphragm Motor
Ease of Accurate Reassembly after Servicing
Interchangeability of Comparable Parts
Ease of Reversing Plug to change Valve Action

See our Exhibit in Booths 214-216 at the Sixth National Instrument Exhibit, Sam Houston Coliseum, Houston, Texas, September 10-14, 1951.



For Example, Consider the Body Assembly of Masoneilan 10,000 Series Control Valves

1. **One-piece Bonnet** of forged or cast steel, with flange piloted in body for strength and accurate alignment. Heavy bolting for strength.
2. **Bolted Stuffing Box** construction on valve sizes 2" and larger. Threaded construction on smaller valves has five-thread minimum engagement, at no compression, for safety. Adequate box depth for sealing at low compression. Manufactured with special tools and gauges to avoid misalignment, and insure reproducibility and interchangeability of parts. Optimum clearances prevent packing flowing, while allowing for expansion over broad temperature range. Fine finish of gland and box surfaces maintains tightness between packing and box wall. Bonnet extension and air-finned construction available for extreme temperature service; bellows-sealed type for special applications. Bolted construction designed to permit removal of diaphragm motor without disturbing stuffing box.
3. **Four Packing Types** available for application according to service conditions: (1) preformed asbestos-and-binder solid ring; (2) braided-jacket, reinforced plastic core, split ring; (3) woven asbestos, †Teflon-impregnated, split ring; (4) solid †Teflon V-ring.
4. **Honed and Highly Polished Valve Stems** reduce stuffing box friction up to 65%; increase packing life; improve performance.
5. **Body** has large flow passages for minimum pressure drop; bridgewall section designed for heavy seat rings and optimum seat-to-seat distance for rated stroke; has uniform standard face-to-face dimensions in cast iron and steel types.
6. **Stem-to-Plug Fastening** by means of grooved, self-locking pin driven into pinhole drilled and reamed, in stem and plug simultaneously, while stem is threaded tightly into plug — insures tightness, prevents shearing pin.
7. **Heavy Valve Plug Guide** sections manufactured to very close tolerances — insures strength, accurate alignment, reproducibility, interchangeability.
8. **Choice of Plug Types** for practically all services. Includes Percentage Piston, Percentage Parabolic, Percentage V-Port with wide flow range, percentage characteristics. Also quick-opening and linear types, Point-4-Factor reduced capacity trim in solid and V-Port designs. Single and double seated. Interchangeable trim designs in comparable sizes. All types (except Percentage Piston) reversible in field to change valve action.
9. **Seat Rings** with heavy shoulders which prevent distortion; piloting at maximum ring diameter insures positive centering; narrow seating surface in bridgewall and long threaded section provide tight joint, prevent leakage. Four heavy lugs aid in removal and replacement.
10. **Long Guide Bushings** (steel valves) of hardened stainless steel in bonnet and blindhead have minimum clearance, assure accurate guiding.
11. **Lubricator** size is ¼" minimum for strength; has ball check valve. Forged steel isolating valve supplied with steel valves for added safety.
12. **Fully Retained Gaskets** of corrugated armco iron or special alloy for tightness and durability.

Accurate Alignment

assured by piloted bonnet, blindhead, and seat rings; by precision control of stuffing box, guide bushing, plug guide section clearances; by manufacture with special tools and gauges for exact reproducibility of all parts.

†Teflon is a trademark of E. I. du Pont de Nemours & Co.

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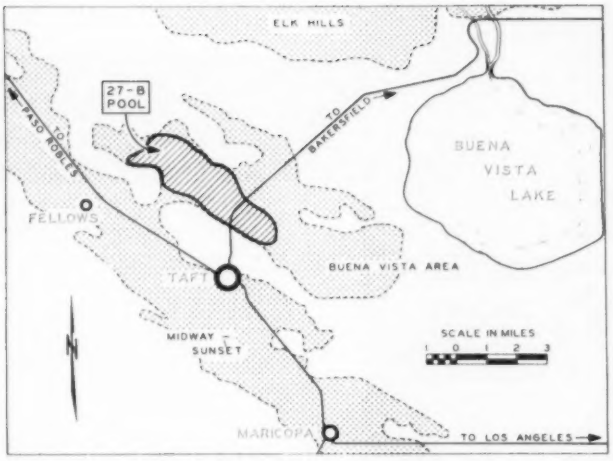

Fig. 1—Regional map of the Taft area.

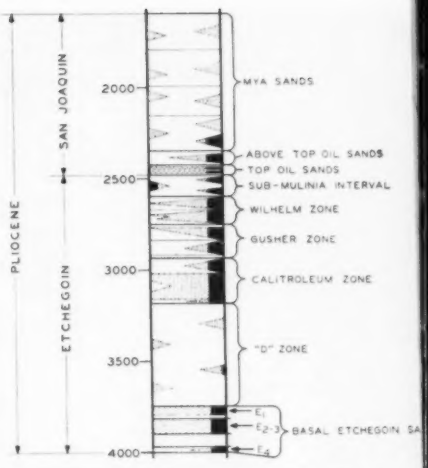

Fig. 2—Columnar section, Buena Vista Hills.

Gas Injection at Buena Vista Hills

Results: Flowing pressures have been maintained, and cost of purchasing, installing, and operating artificial lifting equipment has been deferred in many structurally low wells and probably eliminated in wells higher on structure.

by E. W. Brubaker* and H. J. Stutsman*

THE 27-B pool is located in Buena Vista Hills field about 2 miles north of the city of Taft, in Kern County, California, and lies in 31s-23e, 32s-23e, 32s-24e, Mount Diablo Base, and Meridian. Its position relative to Taft and surrounding oil fields is shown on Fig. 1. Portions of 13 sections are included within the productive limits of the pool. However, no two sections bear the same number and hereafter they will be referred to by section number alone. The pool trends northwest to southeast with a maximum length of 5½ miles, a maximum width of 1¾ miles, and includes a total area of about 4,175 acres.

Stratigraphy and structure—The outstanding structural feature in the Buena Vista Hills area is a double-domed anticline which is conformable from the surface to lower Pliocene deposition. Faults are recognized in shallow zones but are not known to exist in the lower Pliocene sediments. The known productive sands in the area are shown on Fig. 2.

The 27-B pool is comprised of the Basal Etchegoin sands. Four distinct sand fingers are recognized within the productive area; the second and third fingers merge into one sand which prevails over most of the pool. The three sands have been designated as the E-1, E-2-3, and E-4. They are delineated on Fig. 3 which shows the typical electric log development of the various sands.

Fig. 4 is a cross-section along the axis of the structure which shows the general thinning of the producing interval and the convergence of sands from northwest to southeast. The E-1 sand gradually thins and pinches out to the east and southeast. The E-2-3 sand is the thickest of the three sands, reaching its maximum thickness in the saddle of Section 36. The E-4 sand is present throughout the pool, but is too impermeable to be productive in the western portion.

Fig. 5 is an isopachous map of the aggregate net productive sand. The total sand thickness varies from zero to a maximum of 105 ft., averaging 51 ft. for the pool. In general, the productive limit of each sand is defined by edge water on the south flank and a combination of edge water and permeability barriers along the northern boundary. The westerly and easterly productive limits are defined by edge water, permeability barriers, and sand pinch outs.

Fig. 6 is a subsurface structure map of 27-B pool with contours on the top of the Basal Etchegoin E-2-3 sand. The structure is anticlinal, trends northwest to southeast, and has two prominent domes in echelon. The crests of the two domes are 3½ miles apart, and the east dome is 100 ft. structurally higher than the west dome. A broad, high saddle in Section 36 separates the domes. From the saddle, the structure slopes gently in a westerly direction to a flat terrace-like area in Section 34. Structural relief in the pool is large, reaching a maximum on the south flank where production extends more than 1,200 ft. vertically below the crests of the domes. Dips along the flanks of the structure vary from approximately 3° to 35° with the steep dips prevailing. Fig. 7 shows a cross-section perpendicular to the axis of the structure. The section extends from the relatively flat area in Section 34 to the crest of the west dome.

Development

The 27-B pool was discovered on March 23, 1944, with the completion of well No. 358 on Section 27 by Standard Oil Co. of California. Initial production averaged 624 bbl. per day of clean oil on natural flow, with a gas-oil ratio of 382 cu. ft. per barrel. The development of the pool was rapid as shown on Fig. 8.

By January 1947, 33 months after discovery, development was completed on a 20-acre spacing pattern. A total of 201 wells were drilled into the Basal Etchegoin sands, and, of these, 184 were productive. By the time drilling operations were completed, 24 of the 184 producible wells had been shut in due to high gas-oil ratios.

During early drilling in the western portion of the field, completions were generally limited to the E-2-3 sand which was the thickest and the most prolific producer of the three sands. As development spread eastward, the convergence of the three sands made segregation difficult and

*Standard Oil Co. of California, Taft, Calif.
Presented at A.P.I. Division of Production, spring meeting, Los Angeles.

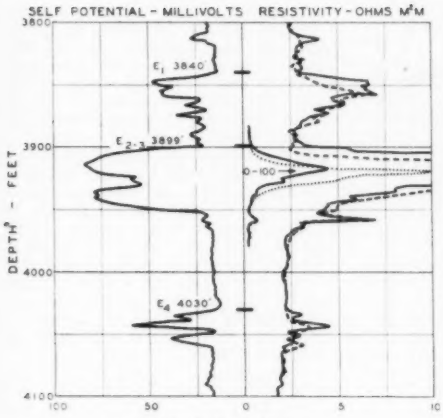

Fig. 3—Typical electric log.

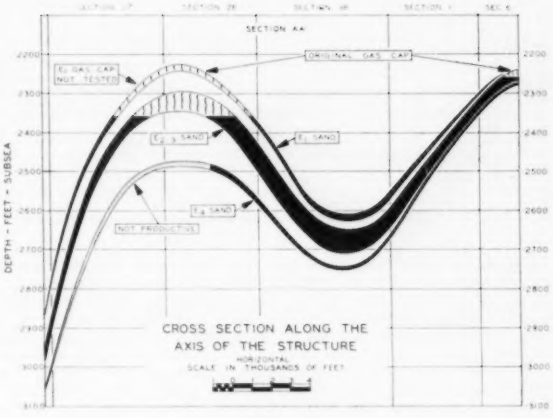

Fig. 4.

multiple sand completions were common.

Drilling and completion practices.—The general practice in completing 27-B pool wells consisted of drilling to total depth with rotary equipment and water-base mud before cementing a 7-in. water string. After obtaining a water shutoff, the cement was drilled out, the hole was wall-scraped, and a 60-mesh 5½-in. slotted liner was hung. Over 65 per cent of the wells were completed in this manner. Oil-base drilling fluid was used in only two wells, one located near each dome. The average time required to drill a 27-B pool well was 24 days.

Sand characteristics.—The 27-B pool sands along the south flank of the structure are generally loose, friable, relatively permeable, and well saturated with oil, whereas the sands along the north flank are argillaceous, compact, and tight, with fair to poor oil saturations. Although the sand grains vary in size from very fine to very coarse, medium to coarse grains predominate in the E-2-3 sand while fine to medium grains prevail in the E-1 and E-4 sands.

Considerable coring was done in the pool, but the core recovery was extremely poor, averaging only 58 per cent. Although coring was extensive, the more permeable, unconsolidated sands were probably not recovered. Table 1 is a recapitulation of the available core data. The performance

TABLE 1—27-B POOL SAND CHARACTERISTICS

Sand	Porosity, per cent of bulk volume	No. of samples	Air permeability Md.	No. of samples
E-1	23.3	98	151	95
E-2-3	26.7	407	293	455
E-4	25.3	92	93	100

of wells completed in the E-2-3 sand indicated that the average air permeability of 293 md. was not representative of the sand. Using Darcy's law for radial flow systems, an average effective permeability to oil of approximately 1,100 md. was calculated.

Oil-base core data were used to determine the relationship between air permeability and water saturation. From this relationship, the average water saturation for each sand was determined using the average air permeability for the E-1 and E-4 sands and the calculated oil permeability for the E-2-3 sand. The estimated water saturations are E-1 sand 38.5 per cent; E-2-3 sand 27.4 per cent, and E-4 sand 40 per cent. Though several restored-state interstitial-water determinations were made on water-base cores, the oil-base water saturations were considered to be more representative.

Fluid characteristics.—The 27-B pool had a primary gas cap in each dome, and the original fluid was saturated at the gas-oil interface but undersaturated at the lower structural positions. At the time of discovery, the pressure at the midpoint of the oil band (2,680 ft. subsea) was 1,575 psia. Based on pressure-volume-temperature data at 2,680 ft. subsea, the initial bubble-point pressure was 1,540 psia., the initial solution gas-oil ratio was 398 cu. ft. per bbl., and the initial formation volume factor was

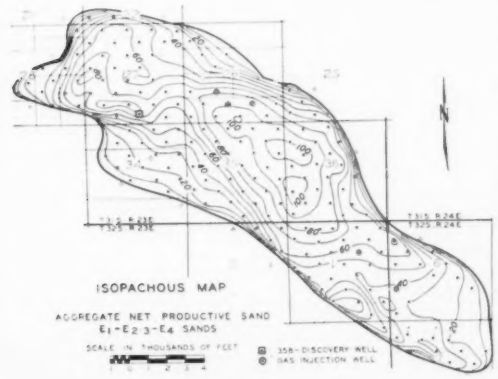

Fig. 5.

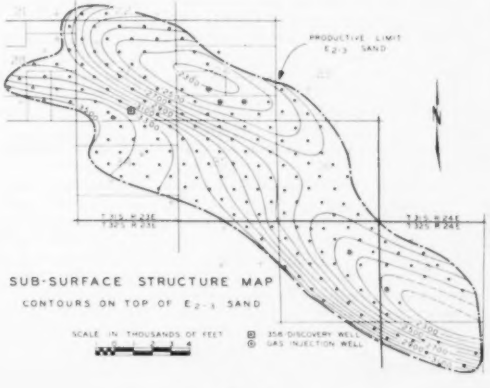

Fig. 6.

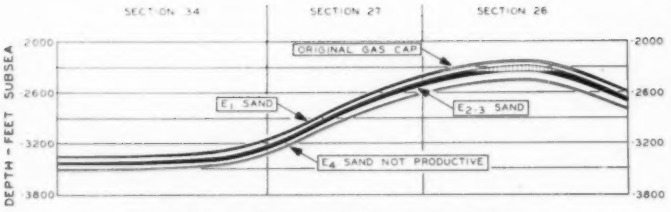

Fig. 7—Cross-section perpendicular to axis of structure.

1,212 bbl. of reservoir space per barrel of tank oil. Fig. 9 presents the physical characteristics of the reservoir fluids as determined by laboratory recombination analyses of trap oil and gas.

Both tank-oil gravities and gas-oil ratios show a definite correlation with structural position. The initial tank-oil gravity varied from 26.3° to 34.2° A.P.I. with gravities decreasing down structure. Initial solution gas-oil ratios varied from about 350 to 440 cu. ft. per bbl. with the greater amounts of gas in solution occurring at the higher structural positions.

Reservoir Performance

Early pool performance indicated that gas-cap expansion and gravity segregation were the principal producing mechanisms. Gas-cap expansion has been appreciable. The existence of a primary gas cap in the E-2-3 sand in the west dome was conclusively proved by formation and production tests. The presence of an initial gas cap in the E-1 and E-4 sands on the west dome was not proved, since the E-1 sand was not tested and the E-4 sand was not penetrated in crestal wells.

Gas-cap expansion in the west dome is a reflection of conditions in the E-2-3 sand since most of the wells are producing from this sand. The east dome gas cap was not penetrated, but its presence was indicated by wells located high on the structure going to gas soon after completion. Although not conclusive, information available on the east dome indicates that the expansion of the gas cap is probably the result of conditions in only the E-2-3 sand. Expansion of the initial gas caps was uniform and by January 1950, the two gas caps joined in the saddle of Section 36.

Progressive gas cap expansion and edgewater encroachment have reduced the oil band to a narrow strip along the south flank. A temporary high-gas-oil-ratio area was formed around one well near the center of Section 35 where the production rates for a period exceeded the rate of gravity segregation. The well was shut in and subsequently produced at reduced rates with a normal gas-oil ratio. The entire north flank is now in the gas cap and it is necessary to produce some of the wells in this area to effect drainage.

The performance of north and south flank wells is quite different. The behavior of south flank wells can be divided into three distinct periods. As shown on Fig. 10, these periods consist of the following:

1. Low - gas - oil - ratio production characterized by decreasing gas-oil ratios.

2. Gas cap moving in causing the gas-oil ratio to increase abruptly with production going to essentially all gas within 3 to 8 months.

3. Shut in due to abnormally high gas-oil ratio.

The approach of the gas cap is usually indicated by increases in both the tubing pressure and the oil-production rate. Wells taken over by the gas cap are generally shut in. Exceptions occur in areas of thicker sand sections and lower dips where drainage has not been complete. North flank wells act somewhat like wells under a depletion drive in contrast to the gravity-drive performance of south flank wells. Gas-oil ratios increase gradually and the production generally does not go completely to gas. Several north flank wells can be produced on a part-time basis at moderately low gas-oil ratios. Wells shut in at gas-oil ratios in excess of 2,000 cu. ft. per bbl. can be produced intermittently at relatively low ratios indicating that some gravity segregation is occurring.

Water influx. — Appreciable water activity has been noted along the south flank and in Section 36 on the north flank. Based on the advancement of the 10 per cent water-cut line, there appears to be considerable edgewater encroachment along the south flank. However, because the sands are generally thin in this region, the volumetric influx of water consists of only a small percentage of the reservoir space. The most salient feature of the edge-water encroachment picture in Section 36 is that the water has encroached across the saddle and is free to gravitate down the south flank of the structure. Dewatering along the north flank combined with gas-cap expansion has reduced the rate of water migration across the saddle.

Gas-oil-ratio control.—A producing policy of shutting in wells when the gas-oil ratio exceeded 600 cu. ft. per bbl. was adopted early in the life of the reservoir. As a result, the pool gas-oil ratios have remained low, thus greatly conserving reservoir energy. The cumulative gas-oil ratio as of January 1, 1951, was only 473 cu. ft. per bbl. The production history of the pool is shown on Fig. 11. Peaks on the pool gas-oil-ratio curve reflect temporary production of wells after

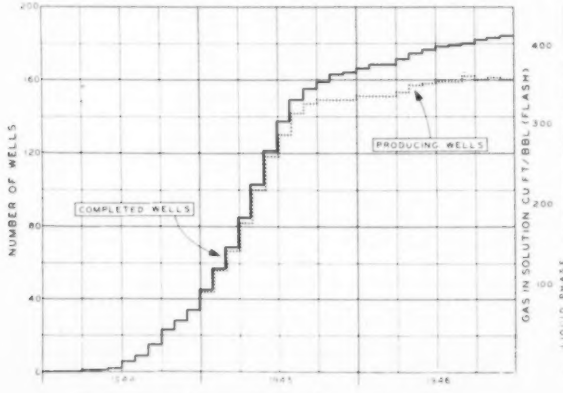

Fig. 8—Cumulative completed and producing wells.

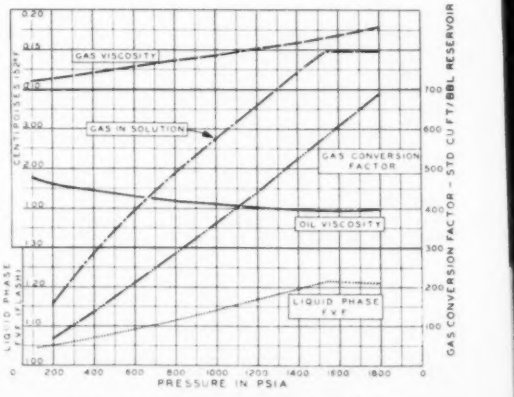

Fig. 9—Characteristics of reservoir fluids.

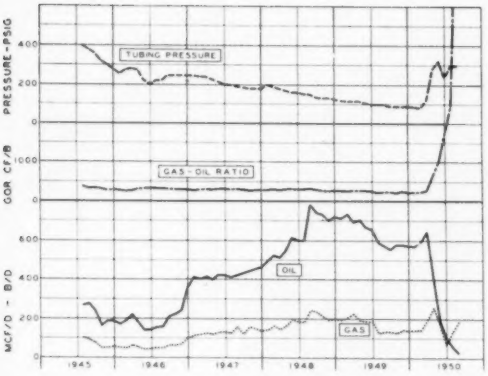

Fig. 10—Performance of typical south flank well.

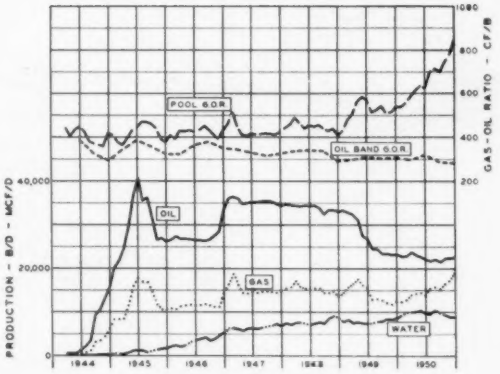

Fig. 11—Production history of 27-B pool.

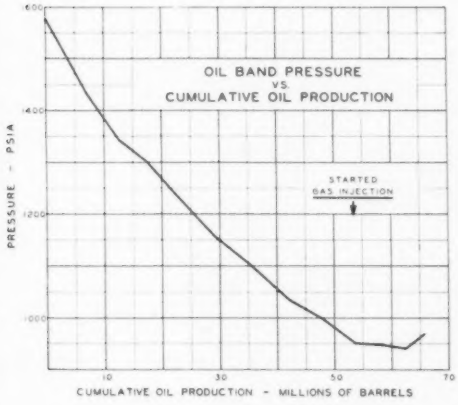

Fig. 12.

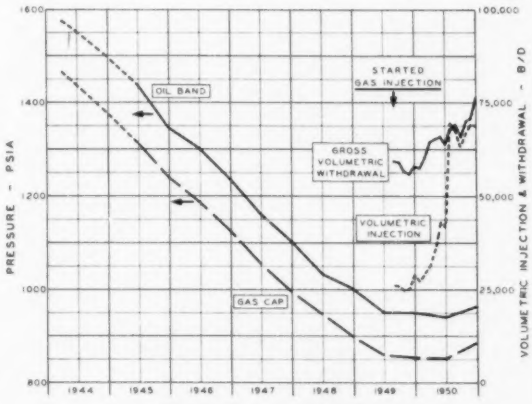

Fig. 13—Pressure trends, 27-B pool.

being enveloped by the expanding gas cap. The gas-oil-ratio history of the oil band includes the wells that are unaffected by edge-water and gas-cap expansion. Oil-band gas-oil ratios have decreased with declining pool pressure and have been only slightly in excess of the solution gas-oil ratios. The oil-band wells produced only a small amount of free gas and the remainder of the gas released from solution migrated to the crest of the structure, enhancing the gas-cap expansion.

On Fig. 12 the midpoint pressure of the oil band is plotted against the cumulative oil withdrawals. Prior to gas injection, the pool produced approximately 53,600,000 bbl. of oil while lowering the oil-band pressure about 630 psi. The slope of the curve prior to gas injection is relatively constant, indicating a recovery of about 99,000 bbl. of tank oil for each pound of pressure decline.

Reservoir pressure. — Pool-pressure trends have been carefully observed by making frequent static-pressure surveys. Coverage has been exceptionally good throughout the life of the pool with the majority of the wells being surveyed approximately once every 3 months. In view of the large structural relief in the pool, volumetrically weighted midpoint pressures have been determined separately for the gas cap and the oil band. These pressures are shown on Fig. 13. The procedure used was as follows:

1. An isobaric map similar to that shown on Fig. 14 was constructed using midpoint pressures taken from individual well pressure decline curves.

2. Gas-cap limits were determined using the isobaric map and a gas-oil-ratio map.

3. The pool was divided into 20-acre parcels with wells located at the corners. Areas of irregular parcels which occur at the productive limits and on the edge of the gas cap were determined with a planimeter.

4. The average sand thickness of each parcel was determined from an isopachous map.

5. The product of average pressure and acre-feet were calculated for each parcel.

The average oil-band pressure was then calculated by dividing the sum of the pressure-volume products by the total acre-feet in the oil band. Average gas-cap and over-all pool pressures were calculated similarly.

The static-pressure buildup time in wells located along the south flank is comparatively short. Buildup times vary from less than 2 hours to approximately 120 hours with the shorter periods prevailing. The productivity index is closely related to buildup time. Initial productivity indexes averaged about 40 bbl. per day per pound pressure drawdown. Indexes declined rapidly at first, followed by relatively slight declines up to the start of gas injection. Productivity indexes subsequent to the start of gas injection have remained essentially constant, averaging about 15.

Unitization and Gas Injection

On May 1, 1949, 27-B pool was unitized with Standard Oil Co. of California as operator. Other participants of the unit are Honolulu Oil Corp., Murvale Oil Co., Tide Water Associated Oil Co., and Union Oil Co. of California.

An 1,800-hp. compressor plant was installed and gas injection was started on August 1, 1949. Initially, gas

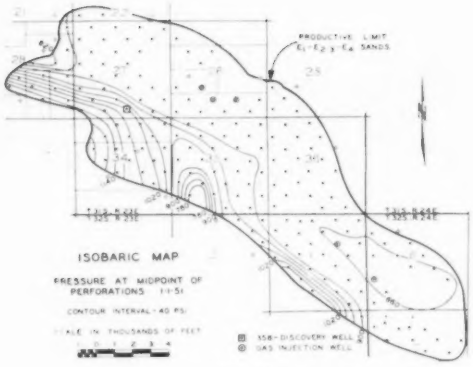

Fig. 14.

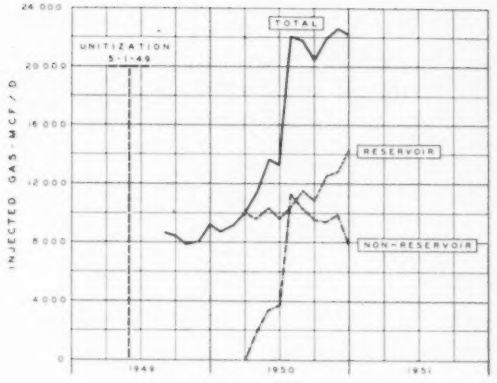

Fig. 15—Injected gas.

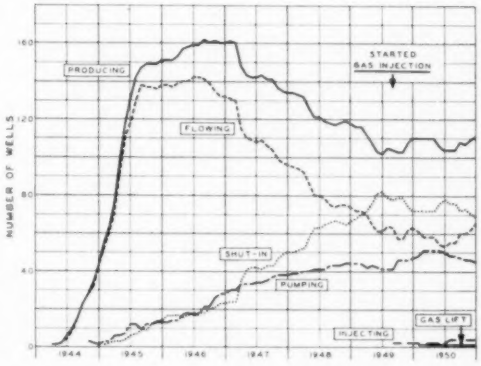

Fig. 16—Well status, 27-B pool.

was injected into one well in each dome. All pool dry gas remaining after lease and plant fuel requirements was returned to the reservoir. Allocation of the injected gas was 75 per cent to the west dome and 25 per cent to the east dome, approximating the percentage of volumetric withdrawals from adjacent areas. The initial injection rate was about 8,700 M.c.f. per day as shown on Fig. 15. In April 1950 the injection rate was increased by supplementing pool dry gas with non-reservoir gas.

In July 1950 two additional wells in the west dome were converted to gas-injection service, and the injection rate was increased to about 22,000 M.c.f. per day. To handle the additional gas, the compressor capacity of the injection system was increased by 600 hp. Seventy-five to 80 per cent of the produced gas has been returned to the reservoir since gas injection started. During the latter half of 1950, the injection of nonreservoir gas was increased, and the total injected gas exceeded the produced gas by about 33 per cent. Initial well-head injection pressures fluctuated from 760 to 830 psi. The pressures at the increased injection rates averaged about 860 psi., ranging from 825 to 900.

Within 4 weeks, formation pressures in wells located along the axis of the structure showed effects of gas injection. The pressure of all gas cap wells had been influenced by gas injection within 3 months. It was noticed that the pressure moved in waves or rings from the crestal area down the flanks of the structure. The movement of these waves closely followed the structure subsurface contour lines. One pressure wave was created when gas injection started and a second wave followed when the injection rate was increased. As of January 1, 1951, pressures in 97 per cent of the wells had been influenced by the injection of gas. The remaining 3 per cent of the wells are in the high-pressure area along the south flank of the structure in Section 1, as shown on Fig. 14. The pressures in these wells have continued to decline, showing no effects of gas injection.

The gas-cap and oil-band pressure trends are shown on Fig. 13. The average oil band and gas-cap pressure decline, prior to gas injection, was about 9 psi. per month. Pressure decline was materially reduced from the start of gas injection to the middle of 1950. During the last 6 months of 1950, oil-band and gas-cap pressures increased 27 and 29 psi. respectively. Effect of edge-water encroachment on the pool pressure is clearly shown by the volumetric withdrawal and injection curves on Fig. 13. From July to December 1950 the gas-cap and oil-band pressures increased appreciably although the amount of injected gas was not sufficient to offset the withdrawal of reservoir fluids. Therefore, the increase in pool pressures could not have been a result of injection alone and edge-water encroachment must have been a contributing factor.

Electric-log and formation-test data indicated that a substantial amount of oil is available in the E-1 sand in the western portion of the pool. This interval was not exposed in the original completions because of the greater productivity of the E-2-3 sand.

Workover program.—An extensive E-1 sand recompletion program was started on August 3, 1950, in the shut-in E-2-3 wells located in the west dome gas-cap area. The first well recompleted in the E-1 sand flowed 220 bbl. per day of oil with a gas-oil ratio of 568 cu. ft. per bbl. By January 1951, 11 wells had been recompleted flowing at a total of 820 bbl. per day of oil and 920 M.c.f. per day of gas.

The performance of wells recompleted in the E-1 sand is different from that of the E-2-3 sand completions. Production declines have been rapid, producing gas-oil ratios are higher, and productivity indexes are lower. The average productivity index for E-1 wells is only 0.31 bbl. per day per pound pressure drawdown while the initial values for E-2-3 sand wells averaged about 40. Pressure surveys in the recompleted wells disclosed that the E-1 sand pressures are from 300 to 450 psi. higher than those in the E-2-3 sand.

In general, the recompletion program consists of the following operations:

1. Kill the well with oil-base drilling fluid and pull tubing.
2. Set a mechanical bridging plug in the water string to exclude the E-2-3 sand.
3. Establish a water shutoff above the E-1 sand.
4. Gun perforate the desired interval.
5. Run tubing on packer and swab in.

The status of the 27-B pool wells is shown on Fig. 16. By the time drill-

(Continued on page 150)

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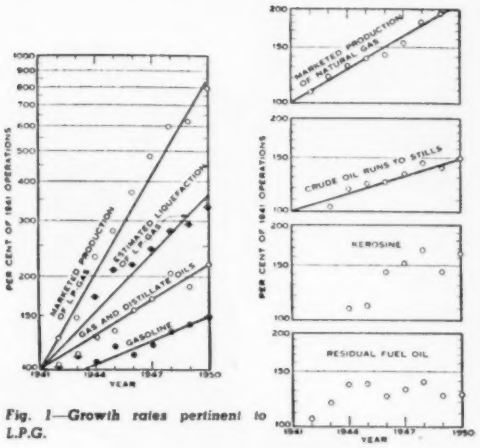

Fig. 1—Growth rates pertinent to L.P.G.

by R. C. Alden,* Forrest E. Gilmore,* and Paul W. Tucker*

IN two recent papers[1,2] we covered the subject of liquefied petroleum gas availability in its over-all aspects, and considered some of the other phases of the problem of L.P.G. as a direct motor fuel. From the over-all viewpoint, the gist of these two papers is as follows:

About a decade from now, when the motor-fuel demand may have increased to 4,000,000 bbl. per day, the total liquefaction of L.P.G. may be between 1,650,000 and 2,000,000 bbl. per day. Of this L.P.G., only 930,000 bbl. per day can be absorbed in presently established uses. If produced, the remaining 720,000 to 1,070,000 bbl. per day of L.P.G. (18 to 27 per cent of the motor fuel) must find new markets, or present uses must be expanded much faster than appears likely at this time.

This summary is not a prediction but, rather, an extrapolation of many trends relating to L.P.G. Therefore, it seems in order to present in this paper some of these trends so that others may make their own extrapolations.

L.P.G. in Reserves

Perhaps the most significant fact developed in these studies is the very large supply of L.P.G. potentially available in our reserves of crude oil and natural gas. The calculations which lead to this conclusion are set forth in Table 1.

The fact that the potential availability of L.P.G. appears to be approaching equality with gasoline is of great significance. Spread over a 15-year life for the reserves, the L.P.G. potential is at the rate of about 2,600,000 bbl. per day, of which less than 6 per cent would be needed for butanizing gasoline. These very large potential supplies of L.P.G.—if, as, and when liquefied and thus diverted from gaseous to liquid-fuel markets—will have very pronounced influences on the entire petroleum industry, and will substantially alter the future requirements for crude-oil production and refining and for the transportation and marketing of petroleum products.

Basic Rates of Growth

Fig. 1 and Table 2 show some basic growth curves for several factors of the petroleum industry. The level of operations for 1941 is taken as 100

*Phillips Petroleum Co., Bartlesville, Okla. Presented at A.P.I. Division of Refining midyear meeting, Tulsa.

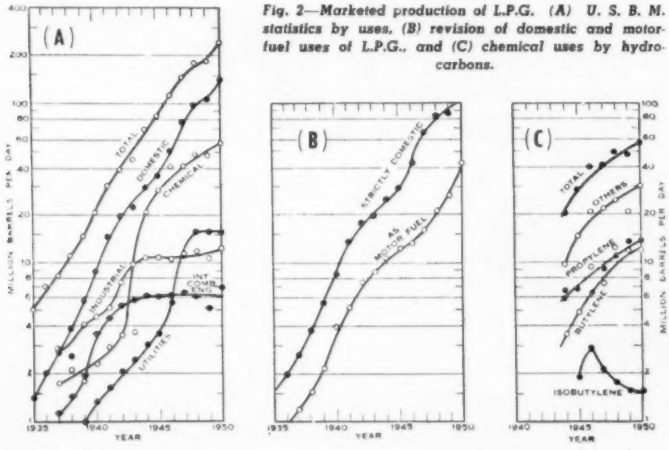

Fig. 2—Marketed production of L.P.G. (A) U. S. B. M. statistics by uses, (B) revision of domestic and motor-fuel uses of L.P.G., and (C) chemical uses by hydrocarbons.

TABLE 1—L.P.G. AND GASOLINE IN PETROLEUM RESERVES

	Dec. 31, 1940	Dec. 31, 1950
Reserves:		
Crude oil (billions of barrels)*	19.0	29.5
Natural gas (trillions of cubic feet)	85	185
Gasoline† in reserves (billions of barrels):		
In crude oil (42.5 per cent yield)	8.1	12.5
In natural gas (0.8 gal. per 1,000 cu. ft.)	1.6	3.5
Total	9.7	16.0
L.P.G. in reserves (billions of barrels):		
From refining of crude oil (12.5 per cent)	2.4	3.7
In natural gas (2.3 gal. per 1,000 cu. ft.)‡	4.7	10.6
Total	7.1	14.3
Ratio of L.P.G. to butane-free gasoline	0.73	0.89
Ratio of L.P.G. to gasoline with 10-lb. R.v.p.	0.65	0.81

*Includes natural-gas liquids. †Butane-free gasoline. ‡Includes L.P.G. in natural-gas liquids.

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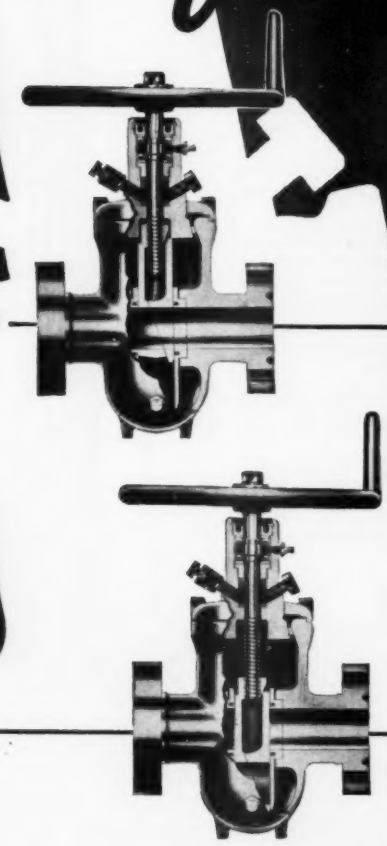

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TABLE 1—ANNUAL GROWTH RATES OF SOME COMMODITIES AND OPERATIONS OF THE PETROLEUM INDUSTRY
(1941-1950)

	Rate of average annual growth (per cent)	Thousands of barrels daily	
		1941	1950
Marketed production of L.P.G.	26.1	30	238
Liquefaction of L.P.G.	15.0	203	668
Gas and distillate-oil production	10.3	518	1,093
Marketed production of natural gas	8.7	*7,680	*16,000
Motor-fuel production	6.1	1,920	2,810
Crude oil run to stills	4.3	3,860	5,740
Kerosine	....	200	326
Residual fuel oil	....	938	1,164

*Millions of cubic feet daily, estimated for 1950.

per cent. The steady and very high rate of growth in the sales of L.P.G. are outstanding features of this study. The rapid rate of growth in the production of gas and distillate oils is a familiar story to refiners.

The fact that both the marketed production of natural gas and the estimated liquefaction of L.P.G. are increasing at a faster rate than is crude oil run to stills is significant in view of the fact that natural gas, on a weight basis, is about three times as productive of L.P.G. as is crude oil.

The steady rate of growth of L.P.G. sales was not materially affected by the war; nor, as will be shown later, has it been affected by the vicissitudes of the individual markets for L.P.G. Ten years ago an increase of 26 per cent in the sales of L.P.G. was an interesting but relatively unimportant matter. However, at a 1950 level of 238,000 bbl. per day, an increase of 26 per cent of 1951 would represent 62,000 bbl. per day, which is the equivalent of either a large new oil field or a large new refinery.

L.P.G. Sales

In Fig. 2 the sales of L.P.G. have been analyzed in several ways. Fig. 2A is the record of the U. S. Bureau of Mines' statistics. Fig. 2B (lower curve) shows an estimate of the L.P.G. used as motor fuel and a corrected curve for domestic use. Fig. 2C shows a breakdown of the chemical markets based primarily on estimates of Robert S. Aries and William Copulsky.[3]

The outstanding feature of Fig. 2 is that all of the markets for L.P.G., with one exception, have manifested declining rates of growth in the postwar years. At this juncture there seems little justification to believe that any of these markets will provide outlets at the rate of growth of past years.

The L.P.G. market for domestic use has been the largest market. As depicted in Fig. 2B, although still growing quite rapidly, there is a slight tendency toward abatement in its rate of growth. One of the important questions in this appraisal is: When, if ever, will a saturation point be reached in the truly domestic markets for L.P.G.? In our own extrapolations we have assumed that the rate of growth of domestic uses would decelerate during the next 10 years so as to correspond more nearly to population and general economic trends.

The second largest market for L.P.G. in recent years has been for chemical uses. These markets enjoyed a rapid acceleration during war years, but have been growing at a relatively slow rate in the postwar years. An interesting observation in this connection is that, in the case of synthetic rubber, it takes only about 30 bbl. per day of hydrocarbons to support a production of 1,000,000 lb. per year of finished product. Even with the tremendous and continuing growth of the petrochemical industry, it is difficult to visualize the expansion of these markets for C_3 and C_4 hydrocarbons to the extent necessary to absorb more than a small part of the large potential supply.

Industrial and utility uses of L.P.G. have manifested reduced rates of growth in recent years. The fastest growing market for L.P.G. is as a motor fuel, as is portrayed in Fig. 2B. Of all the markets shown in Fig. 2, this is the only market which is growing at a faster rate than the total sales.

The over-all conclusion to be derived from Fig. 2 is that only the motor-fuel market for L.P.G. is large

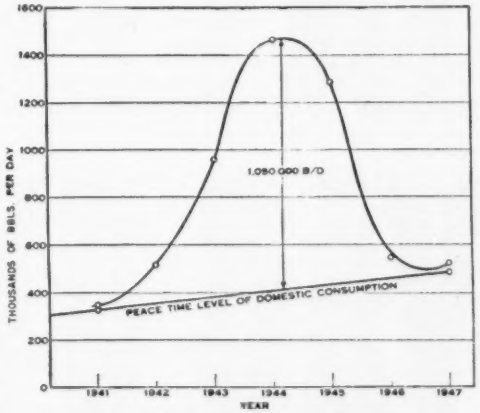

Fig. 4—War demands for gasoline and liquid fuels.†*

*Aviation gasoline and 80 all-purpose motor fuel. †Marine (including U. S. Army, Navy, and Coast Guard) consumption of liquid fuels.

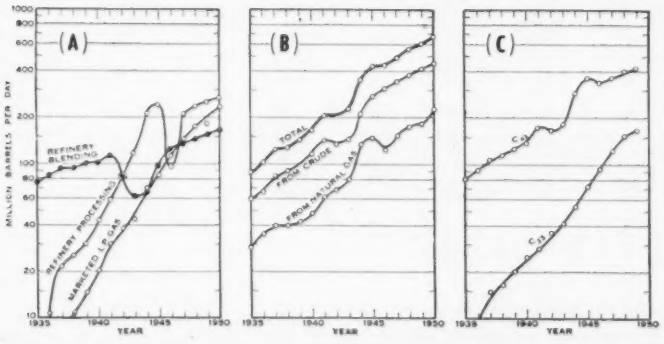

Fig. 3—Estimated liquefaction of L.P.G. (A) uses, (B) from crude oil or natural gas, and (C) C_3's or C_4's.

enough to provide an outlet for the very large new quantities of L.P.G. which would be available for sale if past rates of growth in total sales are maintained in the future. If this new market is not captured by L.P.G., there is every indication that the rate of growth of L.P.G. sales will decrease. However, judging by past history, any new market incentives, such as the current trend toward power uses, can greatly accelerate new production of L.P.G. within the limits of transportation and marketing facilities to keep pace with it.

L.P.G. Liquefaction

In addition to production of L.P.G. for sales, considerable quantities are liquefied for refinery uses. The esti-

mated extent of the total liquefaction of L.P.G. in 1950 is as follows:

	Barrels per day
Marketed production of L.P.G. (sales)	238,000
Butanizing motor fuel	168,000
Refinery feed stock	262,000
Total L.P.G. liquefied	668,000

It is estimated that the liquefaction of L.P.G. for these three purposes was about 165,000 bbl. per day in 1940, which provides some measure of the rapid growth in L.P.G. liquefaction in recent years.

Trends in the liquefaction of L.P.G. are analyzed in several ways in Fig. 3. As to uses (Fig. 3A), butanizing of motor fuel will no doubt remain constant at about 6 per cent of the motor fuel. The refinery conversion of C_3's and C_4's is approaching equilibrium. The sales of L.P.G. are growing rapidly, as has been discussed in connection with Fig. 2.

As to origin (Fig. 3B), about two-thirds of the liquefaction of L.P.G. is from crude oil in refinery operations, and the remaining one-third is from natural-gas operations. As to hydrocarbons (Fig. 3C), the liquefaction of the C_3 hydrocarbons is increasing at a faster rate than is the liquefaction of the C_4 hydrocarbons. The ratios of C_3 to C_4 hydrocarbons liquefied for 1935, 1940, 1945, and 1949 were 0.07, 0.18, 0.20, and 0.39, respectively.

There is a convincing growth curve for the total liquefaction of C_3 and C_4 hydrocarbons if the pronounced war effects are ignored. The annual rate of growth is 15 per cent. If this growth rate is maintained for 1951, it would amount to 100,200 bbl. per day of increased liquefaction. This figure can be compared with the 62,000 bbl. per day, which is the increase for 1951 for L.P.G. sales if the past rate of growth is maintained. Of the difference (viz., 40,200 bbl. per day) between these two probable 1951 values, about 13,300 bbl. per day would be needed for butanizing motor fuel—leaving the remaining 24,900 bbl. per day to go to new refinery conversion operations.

In considering the future rate of growth in the liquefaction of L.P.G., it is evident from Fig. 3 that only the sales of L.P.G. are increasing at a faster rate than is the total liquefaction. The refinery uses are approaching equilibrium with the lower growth rate of gasoline production.

Hence, the same considerations apply for the future which have been discussed in connection with L.P.G. sales. Only the development of considerably enlarged markets will enable the past rate of growth for L.P.G. liquefaction to be maintained.

L.P.G. Available from Current Production

If it is assumed that large new markets for L.P.G. are captured, it is of interest to examine the potential supplies of L.P.G. at current production levels for crude oil and natural gas in order to determine if these very high rates of growth can be maintained for any length of time. Those who are optimistically inclined hold the opinion that the motor-fuel use can increase so rapidly as actually to accelerate the growth rate of sales and liquefaction of L.P.G.

In table 3 the liquefaction of L.P.G., as estimated in Fig. 2B, is expressed as yields from crude oil and natural gas for 1935, 1941, and 1949.

From Refineries

Looking first at the refinery picture, the liquefaction of L.P.G. has attained the very considerable proportion of 7.6 per cent of the crude oil run to stills. Actually, of course, the proportion of L.P.G. available from refinery operations is considerably higher than 7.6 per cent, as illustrated in Table 4, which shows some examples of refinery C_3 and C_4 balances. It is apparent, from these examples, that there is a large additional quantity of L.P.G. potentially available in refinery vapor streams.

TABLE 3—LIQUEFACTION OF L.P.G. FROM CRUDE OIL AND NATURAL GAS

Year	From crude-oil run to stills (per cent by volume)	From natural gas (gallons per 1,000 cu. ft.)*
1935	2.26	0.228 to 0.229
1941	3.65	0.274 to 0.339
1949	7.56	0.419 to 0.516

*Low yield is on the basis of all natural gas produced, less waste. High yield is on the basis of natural gas marketed.

The economic incentives for the increased liquefaction of refinery C_3's and C_4's, or their diversion from present refinery uses to marketed production as liquefied refinery gas (L.R.G.), merit careful analysis. As a generality, advent of catalytic cracking and reforming operations has improved the economics of the highly developed existing refinery gas plants[6] because these operations have resulted in much lower loads of noncondensable gases.

The incentive for increased liquefaction of refinery C_3's and C_4's depend primarily on the differential between their market value as L.R.G. and the market value of fuel oil or other alternate energy source. The diversion of refinery C_3's and C_4's from conversion operations to outside markets will depend primarily on the differential between the value of the resultant gasoline (or other products) and their market value as L.R.G. The three values involved (viz., fuel value, conversion product value, and L.R.G. value) vary greatly among refineries,

TABLE 4—YIELDS OF L.P.G. IN SEVERAL REFINERIES

Location: Reference	Casper, Wyo. (*)	Billings, Mont. (*)	Texas Gulf Coast (§)	Texas Panhandle (¶)	Texas Panhandle (‖)	Penn-sylvania (*)	West Texas (*)	Okmulgee, Okla. (**)
Crude charge, bbl. per day	6,440	7,500	55,000	60,000	70,000	5,000	17,500	8,000
Motor-fuel production,† bbl. per day	3,029	3,160	23,260	35,100	33,800	2,065	10,184	3,500
C_3's from reforming, bbl. per day	None	None	None	None	1,390	(*)	None	None
C_3's from thermal cracking, bbl. per day	None	None	None	Little	45	None	(*)	345
C_3's from catalytic cracking, bbl. per day	325	(*)	975	1,986	2,170	(*)	(*)	None
Total C_3's, bbl. per day	325	(*)	1,070	3,031	4,850	(*)	(*)	409
C_3's, per cent of crude	5.0	(*)	1.9	5.0	6.9	(*)	2.9	5.1
C_4's from crude oil,‡ bbl. per day	95	112	280	1,800	1,855	75	263	60
C_4's from reforming, bbl. per day	None	None	None	None	1,410	(*)	None	None
C_4's from thermal cracking, bbl. per day	None	None	None	Little	25	None	(*)	340
C_4's from catalytic cracking, bbl. per day	438	(*)	1,800	2,739	2,940	(*)	(*)	None
Total C_4's, bbl. per day	533	(*)	2,080	4,539	6,230	(*)	1,002	400
C_4's, per cent of crude	8.3	(*)	3.8	7.6	8.9	(*)	5.7	5.0
Total L.P.G., bbl. per day	858	976	3,150	7,570	11,080	††486	1,510	809
L.P.G., per cent of crude	13.3	13.0	5.7	12.6	15.8	9.7	8.6	10.1
L.P.G., per cent of motor fuel (line 3)	28.3	30.9	13.5	21.6	32.8	23.5	14.9	23.1

*Data unavailable. †Exclusive of catalytically polymerized and alkylate gasolines. ‡Unless stated, assumed to be 1.5 per cent of crude oil. §Calculated from Phillips Petroleum Co. actual operations with high distillate-oil production. ¶Calculated from Phillips Petroleum Co. actual operations. ‖Same as (¶) except reforming to obtain higher octane motor fuel. **Phillips Petroleum Co. actual operations. ††Partly calculated from polymer produced.

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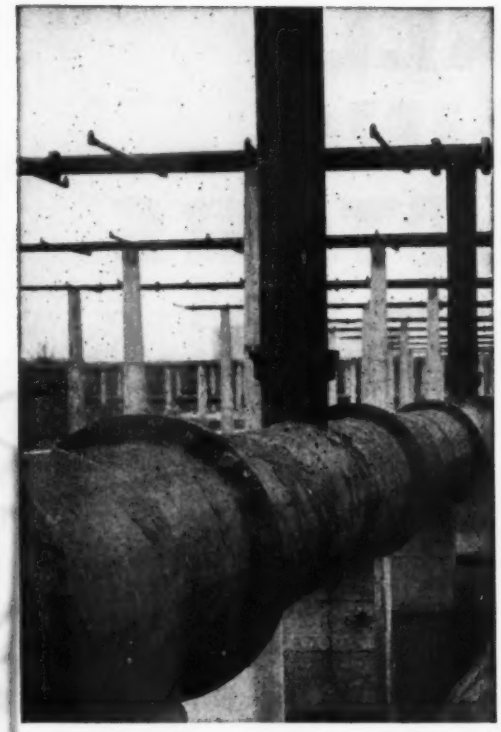

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and they also vary greatly from time to time in individual refineries.

From these general considerations it is probable that, except for the liquefaction of relatively small amounts of propane and the increased extraction in existing gas plants when thermal cracking and reforming are decreased, there will not be large new quantities of L.R.G. available for outside markets unless its relative value in these markets increases considerably.

From Natural Gas

Looking next at the natural-gas picture, the liquefaction of L.P.G. in natural-gas operations amounts to about 0.50 gal. per 1,000 cu. ft. in contrast to an estimated average content of about 2.3 gal. per 1,000 cu. ft.

In Table 5 are listed the C_3 and C_4 contents of some important natural gas supplied to natural-gasoline and cycling plants. Even the leanest cycling-plant natural gas listed has an L.P.G. content higher than the average liquefaction for 1949 shown

TABLE 5
L.P.G. Content* of Representative Natural Gas Supplied to Natural-Gasoline and Cycling Plants

Location—	Propane	Butanes	Total L.P.G.
Natural-Gasoline Plants			
Oklahoma City	1.82	1.25	3.07
Scurry County, Texas	4.97	3.00	7.97
Tex Harvey, Texas	4.16	3.03	7.19
Goldsmith, Texas	1.83	0.95	2.78
Fullerton, Texas	2.25	1.29	3.54
Eunice, N. M.	0.88	0.60	1.48
Sherman, Tex.	0.98	0.53	1.51
Moore County, Texas	1.06	0.55	1.61
Pampa, Tex.	1.81	1.26	3.07
East Texas	5.72	4.02	9.78
Antioch, Okla.	1.73	0.95	2.68
Cycling Plants†			
Carthage, Tex.	1.41	0.29	0.70
Erath, La.	0.59	0.58	1.17
Chocolate Bayou, Texas	0.52	0.29	0.81
Katy, Texas	0.55	0.26	0.81

*Gallons per 1,000 cu. ft. †Well fluids.

in Table 3. It is apparent from these examples that there is a very large additional quantity of L.P.G. potentially available from natural gas.

The economic incentives for the increased liquefaction of L.P.G. from natural gas are very great. For example, with the field value of natural gas at $0.10 per 1,000 cu. ft., propane has a value in natural gas ranging between $0.15 and $0.40 per barrel, depending on whether volumetric or calorific values are controlling. Liquid petroleum fuels command market prices of $1.50 to $5.00 per barrel and up, thus affording a considerable differential to support the diversion of natural-gas C_3's and C_4's into the liquid-fuel markets.

In addition, natural gas is being handled in much larger volumes and at considerably higher pressures than formerly. The concentration of total natural-gas liquids (C_3 and heavier) in the average natural gas is more than twice the concentration of 26/70 natural gasoline. These basic engineering considerations are all in favor of the more complete liquefaction of L.P.G. from natural gas.

1950 Potential Availability

If it is assumed that 12.5 per cent of the crude oil run to stills is a reasonable value for the yield of C_3 to C_4 fractions in refinery operations and that 95 per cent liquefaction is attainable, there could have been 249,000 bbl. per day more L.P.G. liquefied in refineries in 1950 than the 443,400 bbl. per day estimated in Fig. 3B. Likewise, on the basis of an average L.P.G. content of natural gas of 2.3 gal. per 1,000 cu. ft. and 80 per cent liquefaction, there could have been 489,000 bbl. per day more L.P.G. liquefied in natural-gas operations in 1950 than the 224,600 bbl. per day estimated in Fig. 3B. The total of potential new supplies from the two sources for 1950 was 739,000 bbl. per day, a volume high enough to indicate that there is much room for large new sales and liquefaction levels.

Liquefaction of large new volumes of L.P.G. will require very large investments in manufacturing, transportation, and marketing facilities. Consequently, higher costs will be involved than have prevailed for past production, which often has been of a byproduct nature.

Broad Effects on Refining

Much of the anticipated new future production of L.P.G. will result from expansion of natural-gas markets. It is, therefore, interesting to correlate A. J. McIntosh's' estimates of the effects of new natural gas on the demands for liquid fuels with the L.P.G. potential of the new natural-gas supplies. In his paper, McIntosh concluded that new natural-gas supplies amounting to 2,894 million cubic feet daily, beside displacing considerable coal, would reduce the demand for liquid fuels by 264,100 bbl. per day in 1953.

Carrying on from these estimates, there will be a considerable amount of natural-gas liquids (natural gasoline and L.P.G.) liquefied from these new natural-gas supplies. The full potential is of the order of 210,000 bbl. per day, of which about 100,000 bbl. per day (mostly natural gasoline) would be liquefied if the new natural-gas operations are at the average level in this respect. If all the natural-gas liquids in the projected new natural-gas supplies were liquefied and used as motor fuel, the demand for crude oil would be reduced by 474,100 bbl. per day, which would be almost enough crude oil to yield the 264,100 bbl. per day of liquid fuels in terms of 1950 refinery yields.

Obviously, all of the natural-gas liquids in the new natural-gas supplies will not be liquefied, but it is highly probably that there will be enough increased liquefaction from present gas supplies and in refinery operations to have the same effect. It is evident from these calculations that the rapid expansion of natural gas, combined with the increased liquefaction of L.P.G. for direct motor-fuel use, might have only a minor effect on refinery product yields, but it might have a pronounced effect on the rate of growth for new refining capacity. Perhaps more important in these days of very high emergency requirements would be the reduction in the need for new crude-oil production.

War Considerations

The total production of the four refinery fuels follows a rather consistent upward trend which was very little affected by World War II. In terms of refinery yields, the most pronounced effect of the war was a substantial increase in residual fuel oil at the expense of gasoline. Yields of gas and distillate oils, and of kerosine, were not much affected. However, from the viewpoint of consumption, there were considerable diversions of product to military demands. In Fig. 4 is shown the larger elements of this diversion. During the peak years the total production of gasoline and liquid petroleum fuels was about 4,300,000 bbl. per day. The increased military demands amounted to about 1,050,000 bbl. per day, of which almost 700,000 bbl. per day came out of the gasoline production.

In contemplating a future emergency, one can expect drafts by the military greater in proportion than in World War II—with civilian gasoline providing much of the increase. The widespread use of L.P.G. as a direct motor fuel could help substantially to alleviate this situation, at the same time materially reducing the requirements for crude oil. Judging by the record to date this method of augmenting our liquid-fuel supplies would be far less costly in critical materials, manpower, and money than synthetic fuels from coal and shale. From these considerations, it seems self-evident that the acceleration of production, transportation, and marketing facilities for L.P.G. should be a definite part of the mobilization program of the petroleum industry.

Engine Development

It is of great importance to the use of L.P.G. as a direct motor fuel that engine-equipment combinations be designed to use the fuel as efficiently as possible. This can be illustrated by stating that, if the inefficiency is great enough to cause an unnecessary cent per gallon reduction in price, it would amount to more than $30,000,000 per year at a consumption level of 200,000 bbl. per day. With respect to engines, fuels, and lubricants, the refining branch is the chief representative of the entire petroleum industry in most of

(Continued on page 152)

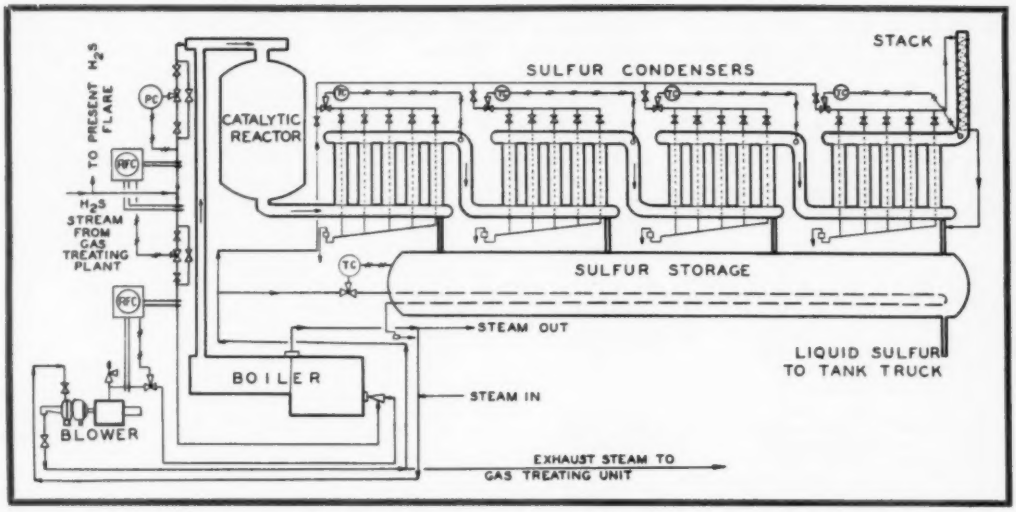


Fig. 1—Sulfur-recovery unit, 10-ton per day capacity, to be operated by Lion Oil Co. in Arkansas' Magnolia field.

Simplicity and automatic operation feature Lion Oil's

New Small-Size Sulfur-Conversion Plant

This 10-ton per day plant is much smaller than the minimum size commonly considered economic

by George Weber

A SMALL, 10-ton sulfur - recovery plant located in Magnolia field of South Arkansas will shortly be placed in operation by Lion Oil Co. The new installation will recover elemental sulfur from sour residue gas produced at an adjacent natural-gasoline plant processing casing - head gas from Magnolia oil field.

This latest addition to a growing list of sulfur-recovery operations is unique in that it is much smaller than the minimum plant size commonly considered as economic. Several factors peculiar to this specific case make the operation practical.

1. The supply of hydrogen sulfide is already available. Lion has for several years operated a treating unit at Magnolia, which removes hydrogen sulfide and carbon dioxide from residue gas purchased from Shell Oil Co.'s Magnolia natural-gasoline plant. The sweetened gas is then moved to El Dorado where Lion operates a refinery and a petrochemical plant. Acid gas has been previously flared at the site as waste.

2. The new operation can be integrated with the sweetening plant without requiring additional operators.

3. The proximity of Magnolia, only 40 miles distant from El Dorado, permits economical transportation of the product in liquid form and requires no investment in specialized transport equipment.

4. Lion, a major producer of ammonium sulfate, is an important consumer of sulfur which is commonly shipped in from the Gulf Coast. Even though 10 tons per day represents but 10 per cent of Lion's normal sulfur requirements for normal operations, the availability of this new supply in the current sulfur shortage makes the operation feasible.

Simple Plant Design

The simplicity of the new plant design makes the operation attractive from the standpoints of initial investment and operating cost. The unit, designed by Graff Engineering Co. of Dallas, will operate automatically.

In general it employs the modified Claus process, wherein one-third of the available supply of hydrogen sulfide is burned to sulfur dioxide and the combustion product is reacted with the remaining two-thirds of hydrogen sulfide over an activated alumina catalyst to produce elemental sulfur and water. The sulfur vapors are liquefied in atmospheric condensers and stored at the plant in liquid state.

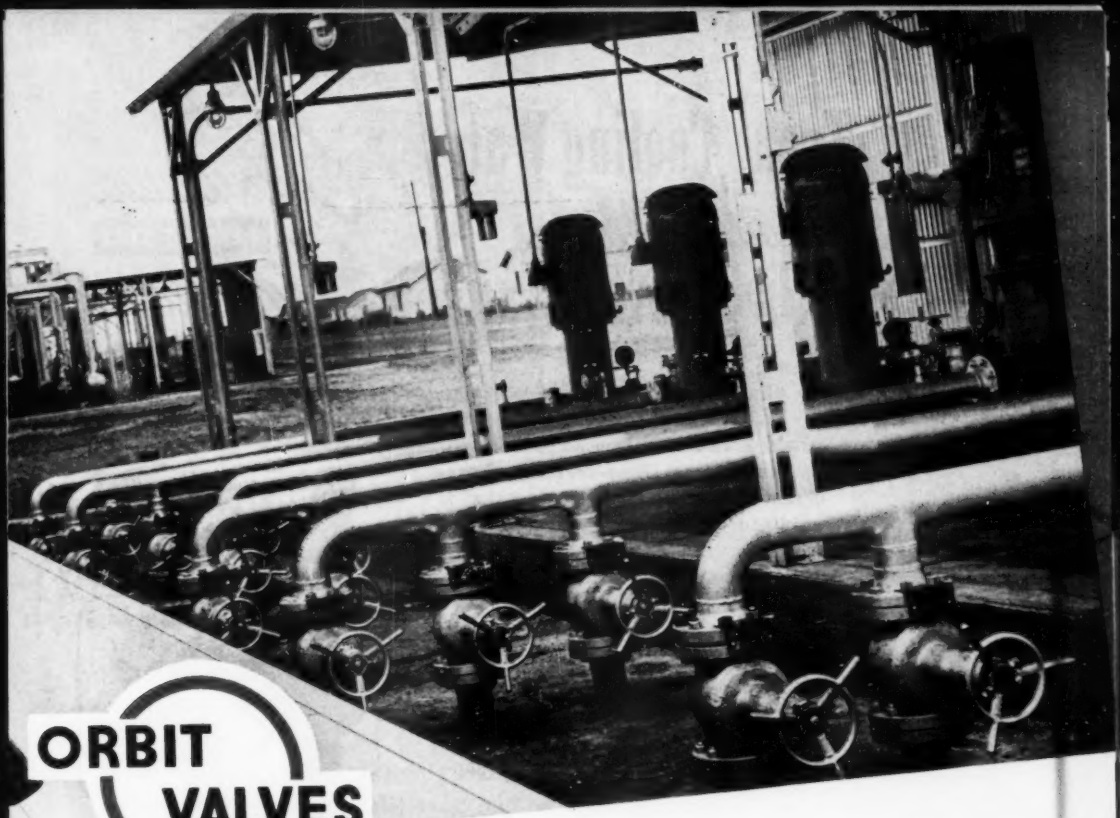
The accompanying flow diagram of the plant illustrates the simplicity of its design. It contains but one moving piece of equipment—the electric-motor-driven air blower. The plant is designed to ultilize gravity flow of liquid sulfur throughout.

Plant Operation

Acid gas produced by Lion's nearby Girbotol unit enters the plant at about 10 psig. and 100° F. A ratio flow controller splits the incoming stream moving one-third of the volume to a waste-heat boiler.

The boiler comprises a standard locomotive-type unit equipped with a specially designed burner. Sufficient air intake to support complete combustion of the H.S in the acid gas is provided by a ratio flow controller. The boiler is designed to generate approximately 2,000 lb. per hour of 60 psig. steam under normal operating conditions. Pressure-tight breeching allows operation of the fire box

(Continued on page 152)



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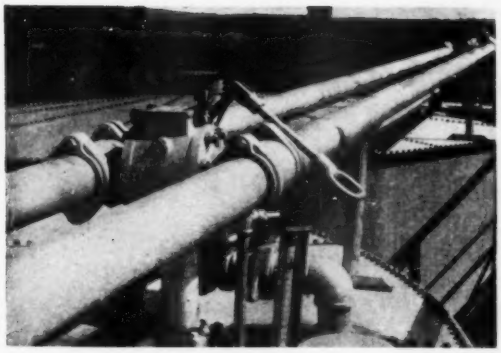


Safety devices on tank hatches provide protection from toxic gas during gaging operations.

Indirect heaters installed initially in flow-line hookup at Worland equipped with adjustable chokes.

Two-Horizon Worland Field Poses Unusual Problems in Drilling and Production

by J. I. Morris*

Major drilling difficulty has been with drilling fluid in trying to get maximum efficiency and reduce frequency of lost circulation

ON the basis of a structure indicated by reflection seismograph work, Pure Oil Co. assembled a unitized block of acreage in Washakie County, Wyoming, during 1943. This block was designated the Worland Unit. Worland field lies in the southern part of the Big Horn structural basin. The field is an anticlinal structure trending generally northwest-southeast and having approximately 1,000 ft. of closure in the Embar (Phosphoria) and approximately 700 ft. of relief in the Frontier zone.

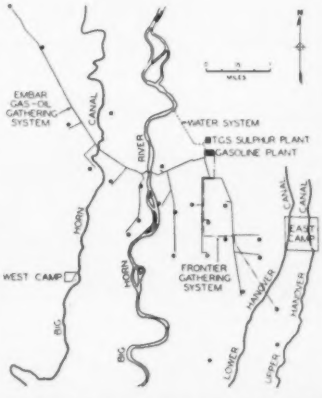
Geographically, Worland field is in the north central part of Wyoming 9 miles north of the city of Worland. The majority of the area is under cultivation, being irrigated with water from the Upper and Lower Hanover canals on the east and the Big Horn Canal on the west sides of the field. The northwest part of the field is in the semiarid "badlands" west of irrigation facilities.

The Big Horn River flows through the field on the north-south trend dividing it into approximately an east and west half. Hard-surface highways, U. S. 20 and a Wyoming State secondary, bound the field on the east and west. Railroad, telephone, electrical power, and sweet-gas facilities are available in the immediate field area. Surface elevations are approximately 4,000 ft. and the annual precipitation of 10 in. does not cause appreciable interference from rain or snowfall.

*Pure Oil Co., Worland, Wyo. Presented at A.P.I. Division of Production meeting, Casper, Wyo.

Discovery

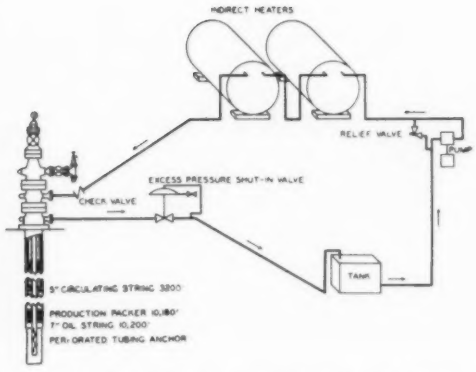
The discovery well, Pure Oil Co. 1-E, Worland Unit, was spudded in near the assumed crest of structure in June 1945. A string of 7-in. casing was set at 10,242 ft. near the top of the Tensleep sand in February 1946. In March 1946 the total depth of 11,379 ft. was reached in the Big Horn dolomite. Cores recovered in the Embar (Permian) zone, a dolomitic limestone section, had shown indication of a slight gas show.



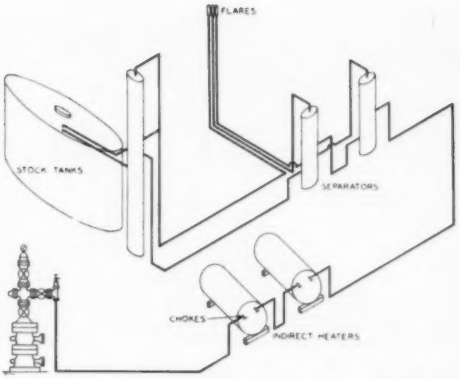
Field gathering and water-systems layout for Worland Unit.

To test this zone 1-E Unit was plugged back to 10,131 ft. and was perforated from 9,990 to 10,055 ft. or through a 65-ft. interval. A drill-stem test was run on this perforated zone; however, it was necessary to discontinue the test after 13½ minutes because the toxic hydrogen sulfide gas endangered the lives of personnel present. The well was completed for a production test by running a production packer and 10,047 ft. of 2½-in. tubing in March 1946. Initial production tests indicated the well potential to be 165 bbl. of 43.5° A.P.I. gravity light green oil per day with a gas-oil ratio varying from 4,900 to 15,000.

The possible complexity of operations in the field was immediately apparent when an abnormal decline in well productivity denoted mechanical trouble in the well. The running of a measuring line found the tubing to be plugged with hydrates. The accumulation was eventually drilled out with small wire-line tools. This job, too, was further complicated in that new hydrates would form nearly as rapidly as the original were drilled out. Continued operations opened the tubing through approximately 2,800 ft. of hydrate accumulations.



Circulating hot oil proved efficient in reducing hydrate formation in Worland operations.



The oil-heating system initially installed for Worland Unit was later revised (left).

The operators were now faced with a twofold problem—the methods by which to produce these well fluids and the associated problem of adequately protecting personnel and property from the toxic gas.

Formation of hydrates in the tubing was reduced by the first installation of a hot-fluid circulating system. The fluid used in the original system was water; however, the incorporate disadvantages of water in below-freezing temperatures led to the adoption of oil as the circulating fluid. This installation demonstrated that the field could be produced commercially.

Although a major production problem had been corrected, continued tests encountered additional problems peculiar to a field of this type. Even after hydrate accumulation was alleviated by use of the hot circulating fluid, a black substance of an asphaltic base combined with foreign materials tended to plug the tubing. This material has been termed asphaltine by various persons. Production into the burn pit eventually cleaned the well.

The failure of spring steel in conventional bourdon-tube-type gages presented a hazard around the well as these failures allowed escape of the gas. This trouble was corrected by using a gage in which the bourdon-tube assembly was isolated from the well fluids by a diaphragm-type protector. The tube assembly is glycol filled to the diaphragm to provide positive transmittal of well pressure.

While continuing production tests at 1 Unit, failure of subsurface material became apparent when well pressure entered the circulating system either through the packer leaking or a part in the tubing. The well pressure opened a crack in a hydraulic swage nipple between the tree and valve on the circulating system thereby allowing a large volume of gas to escape to the atmosphere. As there was no immediate way to stop the leak, inhabitants in the vicinity were evacuated. In order to prevent further accumulation of the gas, tracer bullets from a high-powered rifle were fired into a gas pocket at the well to set it on fire. Remedial operations were started immediately and the well was killed 17 days later.

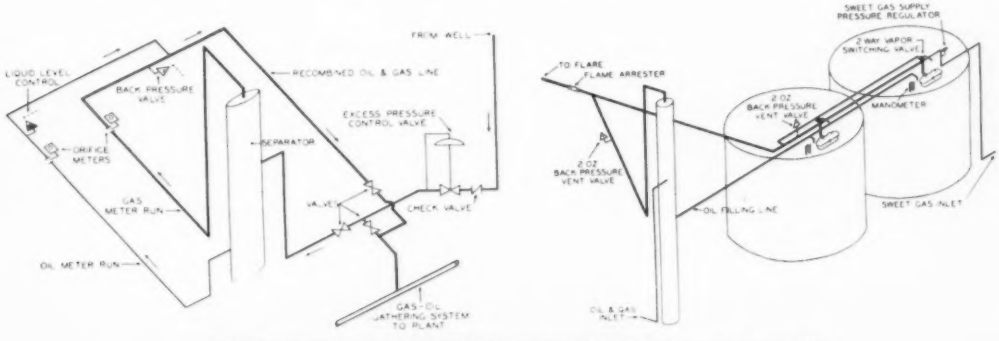
After workover operations were started, it was found that the tubing had parted in a coupling 2,449 ft. from the surface. The well was placed on production in April 1947. Worland Units 2-E and 3-E had been successfully completed during this time so that development of the field was continuing.

Development

The drilling rigs used in Worland were in general consolidated rigs with a rated depth capacity of 10,000 ft. with 4½-in. drill pipe. The usual derrick was an 850,000-lb. capacity, 30-ft. base, by 136 ft. high.

The major drilling problem in the field has been with drilling fluid in an attempt to receive maximum drilling efficiency and reduce frequency of lost circulation.

Four general types of drilling muds were used with varied results, these being starch, lime, sodium carboxymethyl cellulose, and caustic quebracho. The various types were tried in order to secure a minimum loss of water and/or mud to the various porous formations, particularly the productive zones of the Frontier and the Embar. This was especially detrimental in the Embar as cores showed mud blocking in the vugs and fractures. The most used mud was caustic quebracho, as experience proved this to be satisfactory. To drill the Embar, it was endeavored to have the mud at a viscosity of 45-55 seconds, a



Schematic arrangement of Worland metering manifold, left, and vapor system, right.

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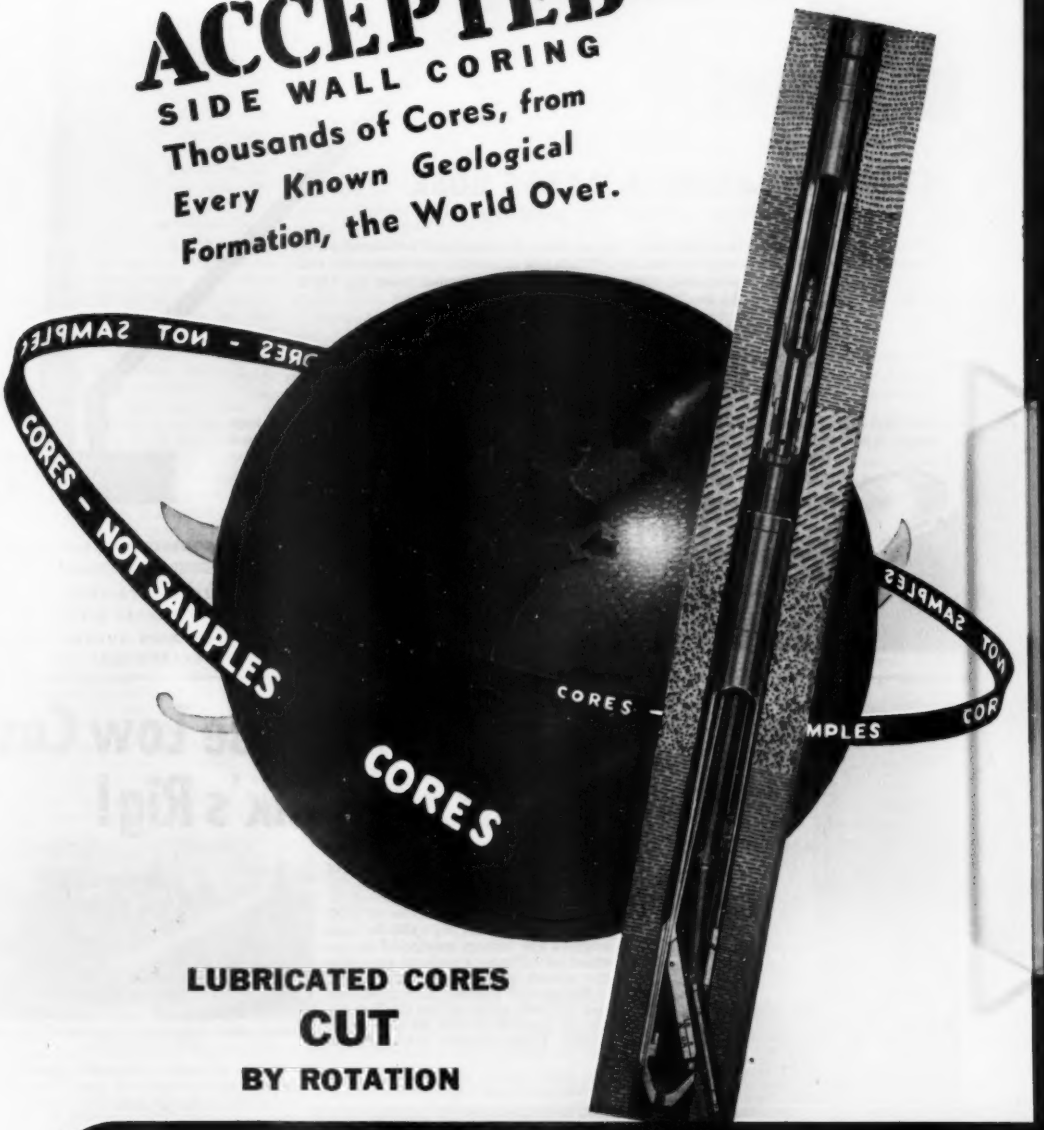

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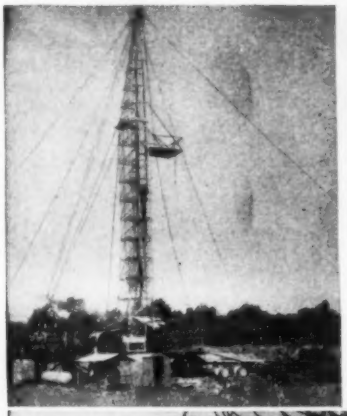
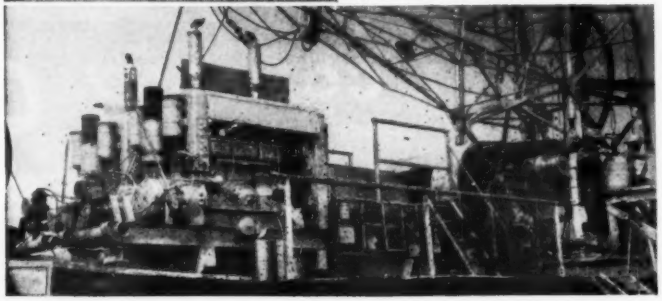


Beene-Hurley Use Low Cost Power on Frank's Rig!

Drillers Beene and Hurley at Bossier City, La., use Frank's portable rig with four Minneapolis-Moline 1210-12A units for power. They are drilling low-cost wells to depths of 6500 feet. The 1210-12A, 12 cylinder unit engines are factory equipped to operate on LP gas or natural gas—the low priced fuels in this area.

Beene and Hurley have mounted two of these units on the drilling table to furnish power to the draw works. These engines are equipped with front power take-off drives and supply 400 hp with LP gas. The other 1210-12A units are remotely located on the mud pump. The complete engineering and installation was done by Beene and Hurley at Shreveport.

Mud pump installation is powered by two MM 1210-12A's.



Two MM 1210-12 on the drilling table operate on low-cost, higher octane LP gas.

This arrangement combines flexibility of layout with important time saving for setting up the rig. Precision tooling and high production methods account for the extremely low selling price of MM heavy-duty oil field power units. Standardization of parts permits interchangeability which assures easier, lower-cost maintenance.

Sales and service of MM oil field engines are handled by the Shrimpton Manufacturing and Supply Co., with branches at Los Angeles, California; Oklahoma City, Oklahoma; and Kilgore, Texas.

weight of 9.5, a pH of 9 plus and a water loss of 3-5 cc.

The upper portion of the Embar limestone presented the greatest loss-of-circulation problem. Although it did not occur in all wells, it was the case rather than the exception. It varied from a minor to a severe loss in that several wells took the volume of mud in the hole and a large portion of that available in the pits. Circulation was regained through the use of standard materials such as mica, ground cellophane, and shredded cane.

Loss of circulation in the Frontier formation was not of the magnitude encountered in the Embar and was corrected by the addition of small quantities of bulk material to the drilling fluid. Minor cases of loss of circulation were encountered in the lower part of the Cody formation; however, these were corrected through mud conditioning. Although loss of circulation constitutes a major problem in Worland, the most detrimental effect and seriousness of the problem arises from the mud reducing the permeability of the productive horizon rather than the possibility of a blowout or continued loss of circulation. In general, the loss-of-circulation problem in Worland is not as serious as that in many fields in the Rocky Mountain area.

Two types of well completions have been used in the Embar of Worland field: (1) the productive zone was drilled and 7-in. oil string was set on bottom and gun perforated for production; or the oil string was set in the top of the Embar before drilling into the pay section. Usually the setting of casing through the productive zone was occasioned by the desire to test zones below the Embar or in the belief that the gas-oil ratio could be better controlled through selective perforating.

Wells high on the structure (Embar top at —5,900 to —6,200 ft.) had a tendency to produce oil of 37°-45° A.P.I. gravity at a gas-oil ratio of 5,000 to 18,000 cu. ft. per barrel. Lower wells (—6,200 to —6,600) produced oil of A.P.I. gravity ranging from 20° to 38° and gas-oil ratios between 1,500 and 4,500 cu. ft. per barrel. Production history did not indicate that selective perforating materially effected the producing gas-oil ratio. As there were no other apparent advantages, the majority of the wells were completed with the oil string set from 2 to 5 ft. into the Embar limestone.

The possibility of hydrates forming in the drill pipe plus the inherent danger of escape of hydrogen sulfide during the test and while the tool was being pulled precluded much use of drill-stem tests.

The necessity for a hot fluid circulating system in completed wells was demonstrated in operations at 1-E Unit. This involved isolating the circulating fluid from the well fluid by setting a production packer in the bottom of the oil string. Approximately 3,200 ft. of 5-in. casing was swung to provide channels for flow of the heating fluid which acted to heat the tubing to a depth required to avoid hydrate formation.

Procedure after running the 5-in. casing, and tubing was to displace the mud with fresh water to which was added a formaldehyde solution as an inhibitor against corrosion from well fluids. The water was displaced with oil for use in the hot oil circulating system. Well-head connections were made and the tubing was landed in the packer to complete the mechanical procedures necessary to produce a well. Wells that did not flow naturally were swabbed in.

Frequent failure of sand lines which had been in contact with sour well fluids, led to the use of galvanized lines and treatment of these lines in corrosion-preventive organic compound bath. After the final pull of each day, the line was passed through the bath and laid out overnight rather than being spooled. The failure of sand lines and associated wire lines has been so severe that some service companies refuse to run their wire lines in wells producing appreciable amounts of sour fluids.

Acidization of limestone has been effective in increasing productivity of Embar wells. The normal procedure was an initial treatment of 5,000 gal. of 15 per cent hydrocloric acid containing emulsion-breaking, surface-tension-reducing, and corrosion-inhibiting agents, followed by a 15,000-gal. treatment of the same type acid. These quantities are average values as some wells were acidized with as little as 3,000 gal., and others, with as much as 50,000 gal.

Maintenance and supervision were complicated by the fact that the Big Horn River separates the east and west sides of the field. There was no bridge in the immediate vicinity; consequently, an 18-mile trip by road separated the two areas. Bridges are located at Rairden north of the field; and Worland, south of the field—the distance being approximately the same either way. As development continued simultaneously on both sides of the river, a camp and a stock point were established on each side.

An FM radio network was installed to assist in control of field operations and to provide an emergency communication system. Transmitting and receiving sets were placed at the field production office, cars and residences of supervisory personnel, rotary-drilling rigs, and in switchers' pickups.

Earthen dikes and pipe stanchions were placed around wells, tank batteries, and production facilities in the river bottom to protect these installations from river ice in the event of an ice jam.

System Heaters

The most economical and efficient method of reducing the detrimental hydrate formation in well-fluid flow facilities was the application of heat. The hot oil circulating system furnished heat to the well tubing and flow-line heaters transfer heat for surface installations.

In the hot oil circulating system, electric - motor - driven reciprocating or centrifugal pumps take suction from a 30-bbl. galvanized steel surge tank and discharge through indirect heaters to the well head. Oil from the annulus returns to the surge tank. In the 1,500,000-B.t.u. per hour rated capacity indirect heaters, the temperature of the circulating oil is raised as high as 180° F. In order to allow a minimum heat loss lines from the heaters are insulated and/or buried.

The circulation movement of hot oil in the annulus transfers heat to the fluid being produced. Flow is down the annulus between the 2½-in. tubing and 5-in. casing and up the annulus between the 5-in. and 7-in. casing. Temperature drop between the well inlet and outlet of this system varies from 35° to 75° F.

A check valve is installed on the circulating system inlet line, and an excess-pressure shutin valve on the outlet line to prevent well fluids from escaping through this system in the event of a packer or tubing failure. These valves and pipe on the well side are of design specifications capable of withstanding well pressures. The pump is protected from operating against a closed discharge by a pressure-relief valve which allows discharge into the suction.

In the flow-line hookup that was used while producing into tank batteries during the first period of operations, tubing-head pressure was reduced to the first-stage separation pressure through four adjustable chokes at the indirect heaters. Pressure drop was taken at these points in order to maintain well-fluid temperature above the hydrate point. These 1,150,000-B.t.u. per hour, high-pressure two-pass heaters supplied additional heat to keep the fluid above the hydrate temperature during three-stage separation.

First-stage separation was at approximately 250 psig. and the second-stage was at approximately 50 psig. The separators were conventional 2½ by 12-ft. 480-psig. working-pressure units. A third-stage 20-in. by 34-ft. shop-made unit operated at 2 oz. pressure.

Tank Batteries

To avoid transporting well fluids unnecessary distances, individual tank batteries were installed for most wells in the first period of operation. Where proximity of offset wells made separate batteries impractical, first-stage separators were operated at well locations prior to movement of fluids to the consolidated tank battery. From two to six bolted, 1,000-bbl., galvan-

(Continued on page 155)

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Objectives and Techniques of

COOLING-WATER TREATMENT

—by Durando Miller*

This article reviews briefly current practice in cooling-water treatment without dwelling at length upon the theoretical considerations involved, but instead relating actual experience with various types of treatment at a number of plants, to see what correlation exists between theory and practice.

DWINDLING supply or complete absence of any dependable source of cool water has greatly increased the application of circulating cooling-water systems, where the water is reused to the maximum extent possible. Once-through systems, where cool water makes only a single pass through the heat-exchange equipment, can now be employed only where large lakes or rivers, or the oceans, provide unlimited supply of cool water.

Types of Cooling-Water Systems

Circulating cooling systems may be classified in two broad types—the open system where cooling is effected by evaporation of a portion of the stream, and the closed system where cooling takes place in a radiator or other closed heat exchanger.

The evaporation of water in the open system causes concentration of the dissolved solids in the water. In the closed system, little or no evaporation takes place, hence solids do not concentrate appreciably.

In general, the open system is used for the larger cooling-water applications, such as process cooling in refineries and chemical plants, and condenser cooling in steam-generating plants. The closed system is more often used for cooling jackets of diesel engines, compressors, and similar equipment.

While the once-through system often requires some degree of water treatment, it is usually not of an extensive nature. However, in the open circulating system, the concentrating effect due to evaporation greatly magnifies treatment problems.

Closed systems frequently require water of very high quality, but as makeup to such systems is small, being due primarily to leakage, and high solids concentrations are absent, treatment problems are less complex than for the open systems.

Cooling-Water-Treatment Objectives

Let us consider for a moment the general requirements of a cooling water:

First for obvious reasons it must not unduly decrease the rate of heat transfer in the equipment where the heat is to be absorbed.

Second, it must not excessively attack any part of the cooling system, including the metal of the heat exchangers, interconnecting piping or circulating pumps, or the wood of the cooling towers.

The cooling water will be unsuitable from the first consideration if it deposits excessive amounts of scale, plugs heat-exchanger tubes with mud or silt, or coats metal surfaces with organic slimes.

For the second consideration it will be unsuitable if it corrodes or erodes the metal parts of the system, or if it attacks the wood of the cooling tower.

There is a degree of interrelation between these two considerations. For example, corrosion may not only result in a wasting away and eventual failure of heat-exchanger tubes, but the corrosion products may contribute to plugging or scaling of other parts of the system. Incomplete scale formation will accelerate corrosion of surfaces having no scale.

In determining the best method of cooling-water treatment for a given application, economics plays an important part. Were it not for the large quantities of water involved, it would be possible to prescribe one type of treatment which would provide ideal cooling water for all applications. However, cost of equipment and chemicals required for such treatment would be prohibitive for the usual installation.

In the case of open circulating systems, the treatment costing the least per 1,000 gal. of makeup is not always the most economical. A more complete form of treatment may permit sufficient reduction in makeup water requirements to more than offset the higher cost per 1,000 gal., and permits use of smaller-capacity water-treating equipment.

General Design Considerations

Design of a cooling-water-treatment plant involves careful consideration of the following factors:

1. Type of cooling system—whether once-through or circulating, and if the latter, whether open or closed.

2. Materials of construction of heat-exchange equipment—whether alloy or ferrous metal.

3. Chemical and physical analysis of the available raw water.

4. Rate of flow of cooling-water stream.

5. Water temperatures to be expected in various parts of the cooling system.

6. In the case of open circulating systems, the type of cooling equipment used—whether mechanical draft or atmospheric cooling tower or spray pond.

The flow of water requiring treatment varies greatly depending upon the type of system used. In the once-through system, the treatment must be applied to the entire cooling water stream which may amount to many thousands of gallons per minute. In the closed system, the flow rate will be only a fraction of 1 per cent of the cooling-water stream, to make up for losses due to leakage and possibly a small amount of evaporation from hot wells or expansion tanks. Such makeup is normally a matter of a few hundred gallons per day.

The flow to be treated in the open circulating system equals the quantity lost due to evaporation in the cooling tower, plus whatever water is physically carried out of the tower (called "windage loss") plus the amount purposely blown down from the circulating stream to keep dissolved solids within desired limits.

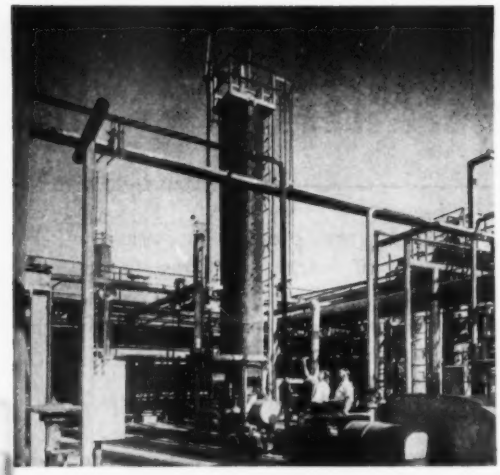
Evaporation is usually calculated as 1 per cent of the circulating rate for each 10° F. cooling taking place in the tower. Windage varies depending upon the type of tower, running 0.2 per cent or less for mechanical draft towers, about 0.5 to 1 per cent for atmospheric towers, and 2 to 5 per cent for spray ponds.

For equilibrium conditions, the solids entering the cooling-water system must equal the solids being removed. The concentrating effect of evaporation must be balanced by the deconcentrating effect of windage and blowdown.

The following formula is useful in calculating the number of concentrations taking place in a cooling water:
Let E = evaporation, W = windage, B = blowdown—sum of which = makeup

S_m = solids in makeup
S_r = solids in recirculating stream
C = number of concentrations

*Technical department, Permutit Co. Presented at Midwest Power Conference, Chicago.



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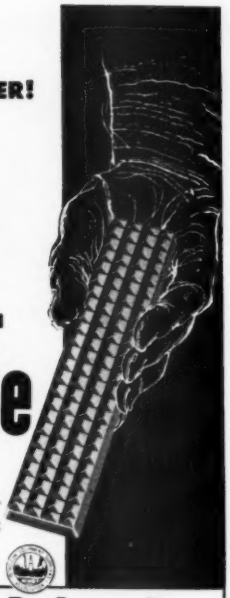

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then: since "solids in" must equal "solids out":

$$(E + W + B)\, S_m = (W + B)\, S_r$$

also, number of concentrations $C = S_r/S_m$

$$\text{Therefore, } C = \frac{E + W + B}{W + B}$$

The maximum concentration obtainable would, of course, be with zero blowdown, in which case

$$C \text{ max.} = \frac{E + W}{W}$$

Where the desired number of concentrations has been established, the formula can be rearranged, to determine the blowdown required:

$$B = \frac{E - W\,(C - 1)}{C - 1}$$

Let us now consider the specific forms of cooling-water treatment, primarily as applied to the open circulating system, with later consideration of the modifications used for once-through or closed systems.

Clarification

Surface water supplies containing appreciable amounts of suspended matter should be clarified to prevent accumulations of mud and silt in heat-exchanger tubes, pipe lines, and cooling-tower basins.

High rate upflow sludge blanket equipment, such as the precipitator,[1] is ideally suited for this purpose. In the precipitator, coagulating chemicals and raw water are intimately mixed in the presence of previously formed precipitates, resulting in growth of large and tough floc particles, readily separated from the water in the expanding area of the upflow zone. Effluent turbidities of 2 to 5 p.p.m. are commonly obtained. Water in this quality can be used directly in most cooling water systems without the need for filtration.

Prevention of Excessive Scaling

The most common type of scale found in heat-exchange equipment is calcium carbonate, resulting from calcium bicarbonate naturally present in the cooling water breaking down under rising temperature. On waters high in sulfates, calcium sulfate scale may be formed, but such cases are rare. Magnesium compounds rarely cause scale in cooling-water systems.

The presence of dirt, organic slimes, oil, or corrosion products in the cooling water may serve as a binder for the scale-forming precipitates, thus aggravating conditions.

Scale formation is usually more pronounced in the hotter parts of the heat-exchange equipment, and it is not uncommon to find clean metal, possibly undergoing corrosion, at the cooling-water inlet side, with heavy scaling at the higher-temperature outlet side of the exchanger.

In considering treatment to limit scaling, it is first necessary to consider the construction of the heat-exchange system. If heat-transfer surfaces are of corrosion-resistant alloy construction, it is often feasible to design treatment for practically complete elimination of scale-forming constituents.

On the other hand, if ferrous heat-exchange surfaces are used, as is often necessary due to wartime restrictions on use of alloys, complete elimination of scale may lead to serious corrosion, particularly in open circulating systems where the cooling water is saturated with oxygen due to passage through the cooling tower. There are, however, measures that can be taken to prevent such corrosion, as will be described later.

From knowledge of the recirculating rate, type of cooling tower, and cooling effect in the tower, we can determine the maximum concentrating effect theoretically possible, and from the analysis of the raw makeup water, can calculate how high the scale-forming constituents (primarily calcium hardness and dicarbonate alkalinity) would rise if no treatment were used.

The question now is, will scale form or not? Our best guide in the matter is the calcium carbonate saturation index, commonly called the Langelier index, which is a measure of the tendency for calcium carbonate to precipitate from a water under given

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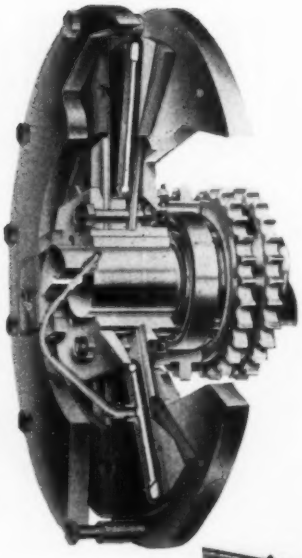

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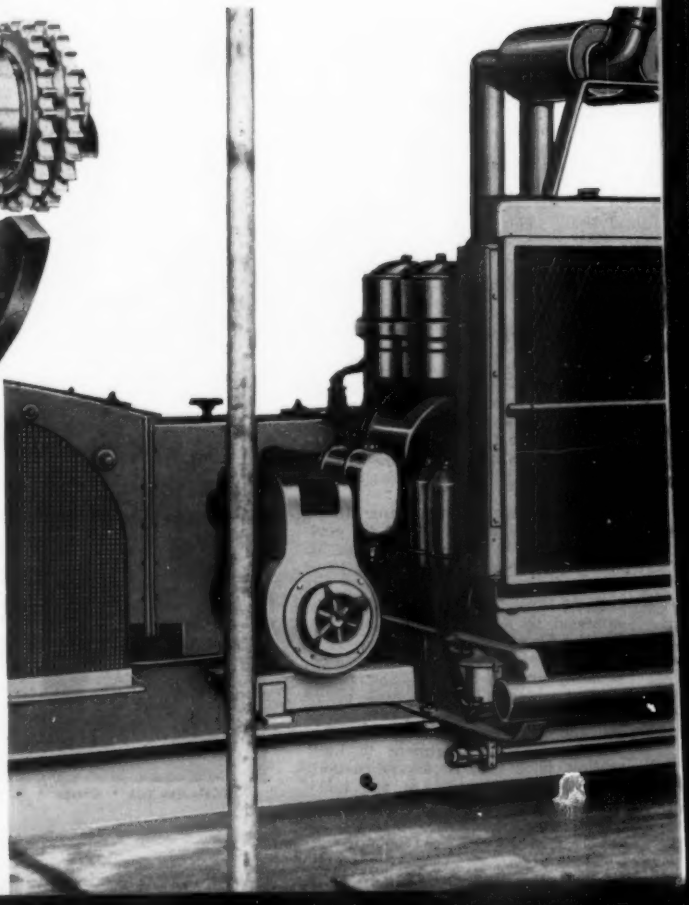

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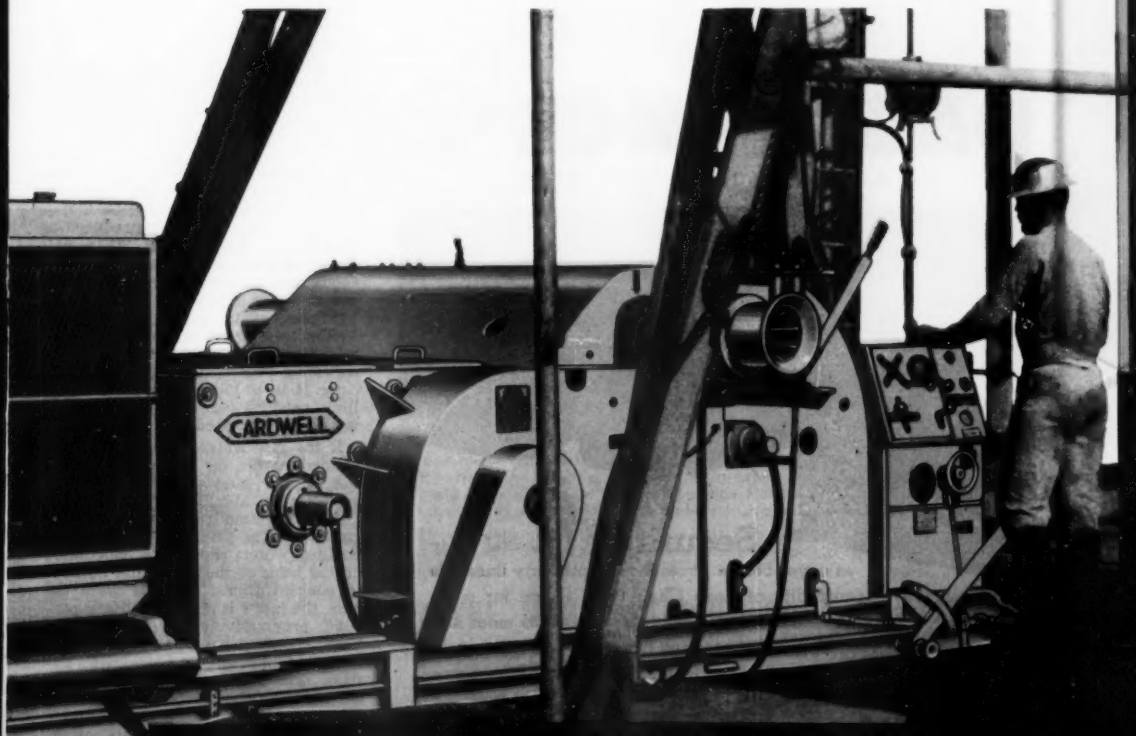

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conditions of calcium hardness, alkalinity, pH, temperature, and total dissolved solids.

A complete description of the Langelier index and its applications and limitations may be found in the literature[2,3,4] but for the purpose of this discussion, it should be noted that a positive index indicates a tendency to deposit calcium carbonate scale, while a negative index indicates a tendency to dissolve a scale already laid down. Decrease in calcium hardness, alkalinity, temperature or pH will lower the index, while decrease in total dissolved solids will slightly increase the index. Nomographs and special Langelier index slide rules are available as a means of rapidly calculating the index.

It should also be noted that although a positive index indicates a tendency towards scaling, it does not provide a measure of the amount or rapidity of scale formation, since this is dependent upon the magnitude of the calcium and carbonate or bicarbonate content of the water.

It should be kept in mind that in calculating the Langelier index for open systems, it is the analysis of the circulating cooling water that is used, not the treated makeup.

The pH requires special consideration, because, of course, it does not concentrate as do calcium, alkalinity, etc. The assumption is frequently made that in the absence of phenolphthalein alkalinity, the pH of the water leaving the cooling tower will be 8.3, due to complete elimination of free carbon dioxide in the tower. This assumption appears reasonably valid except where acid gases in the atmosphere cause lowering of the pH, or the circulating water has a hardness very much lower than the alkalinity, in which case part of the bicarbonates are converted to carbonates, resulting in phenolphthalein alkalinity and a pH which in some cases may be as high as 9.5.

Assuming that we find that the concentrated cooling water has a positive index, we can decrease the index by reduction of either calcium hardness, bicarbonte alkalinity, or pH, or a combination of all three. Temperatures, of course, are fixed by the particular conditions of the cooling-water system, and usually cannot be varied. Since the total dissolved solids content has a minor effect on the index, it is seldom used directly as a means of control.

One obvious method of reducing both calcium and alkalinity is by decreasing the number of concentrations in the cooling water, by means of blowdown. This has the disadvantage of increasing the total makeup requirements, and is seldom used as the only means of control. Also, in many cases the index would still remain positive no matter how much blowdown was employed. Moderate amounts of blowdown are frequently used, however, in conjunction with suitable treatment of the makeup water.

A widely used form of treatment is reduction of calcium hardness and an equivalent amount of alkalinity by lime treatment in a precipitator of the type described earlier. This treatment simultaneously lowers two of the factors contributing toward the positive index.

The precipitator effluent is normally stable with respect to calcium carbonate saturation, indicating that the Langelier index is only slightly positive, at the treated water temperature. However, increased temperature plus the concentrating effect in the cooling system would result in an excessively positive index if no further treatment were applied. Therefore, acid is fed to the precipitator effluent for reduction of pH and alkalinity as required.

Determination of the correct acid dosage is a matter of judgment depending upon the water analysis and the number of concentrations taking place in cooling system. In general, it is unwise to attempt to reduce alkalinity to less than about 10 p.p.m. by acid. As an alternate to this acid treatment, a polyphosphate may be used following lime treatment, especially in cases where the cooling water is not heated to a high temperature.

The residual calcium and alkalinity values will vary depending upon their relative amounts in the raw water, but ordinarily either calcium or alkalinity (in some cases both) can be reduced to about 35 p.p.m. Where the raw-water alkalinity is appreciably higher than the calcium hardness, the effluent alkalinity will be higher than 35 p.p.m., but can be reduced as indicated by feeding acid. Where calcium hardness in the raw water exceeds the alkalinity, indicating the presence of calcium noncarbonate hardness, effluent calcium hardness will exceed 35 p.p.m. unless soda ash is fed in addition to the lime. For economic reasons this is rarely done, since it is usually more practical to limit calcium content of the cooling water by increased blowdown.

If the raw water also contains suspended matter, the precipitator serves the double purpose of clarification and calcium alkalinity reduction.

After the lime treatment in the precipitator, plus acid, the index of the cooling water should be calculated on the basis of the maximum number of concentrations. If, as is often the case, the index is still excessively positive, progressively lower concentrations should be assumed (requiring increasing amounts of blowdown) until a satisfactory index is obtained. An index in the range of plus 0.5 to plus 1.0 at the highest temperature in the system is usually satisfactory, but where the range of water temperatures is wide, say 30° F. or more, it is advisable to consider careful

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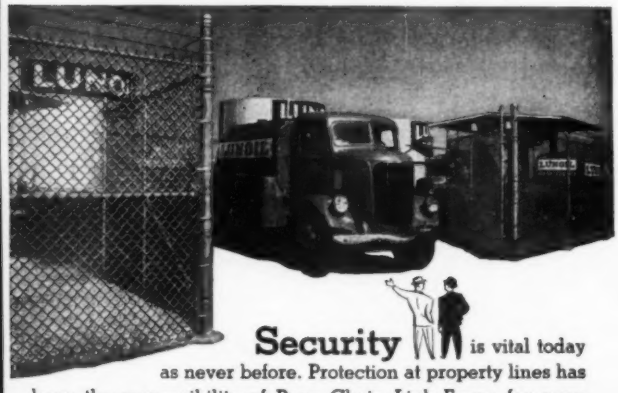

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adjustment of the pH of the circulating water to obtain a fairly constant index and thus uniform scaling, over the entire temperature range, using the method proposed by Sheppard T. Powell.[56] This procedure is particularly desirable from the standpoint of corrosion prevention, as will be discussed later.

In cases where corrosion can be disregarded, the index can be maintained near zero, or even on the negative side, by reducing the alkalinity sufficiently with acid, which has the advantage of keeping cooling surfaces free from scale, with correspondingly better heat transfer efficiency.

As mentioned earlier, however, a positive index shows scaling tendency only, and judgment must be exercised in establishing the index for a specific job, giving consideration to the actual amount of calcium and bicarbonate in the circulating water, and thus the scaling potential that exists.

Clear, hard water supplies may be treated for control of scaling by sodium zeolite softening all or a portion of the water. Both calcium and magnesium hardness are exchanged for sodium as the water passes through the granular zeolite bed. When the exchange capacity of the zeolite is exhausted, the softener is regenerated by passing a solution of common salt brine through the bed. This type of treatment has the advantage of simplicity, since operation of the softener requires no chemical control, and where desired the regeneration procedure can be made fully automatic.

In the case of 100 per cent zeolite softening, the hardness is reduced to a few parts per million thus making it possible to carry high concentrations in the circulating water, for even though the calculated index may be positive due to high alkalinity and pH, the amount of hardness present is so small that very little scale can form.

Complete zeolite softening should be used with discretion, however, since absence of scale may lead to corrosion unless steps are taken to prevent it.

Partial zeolite softening with hardwater bypass, plus acid feeding if required for reduction of alkalinity, provides a simple and flexible means of preventing excessive scaling, and by leaving appreciable residual hardness present, permits protection against corrosion of ferrous heat exchange surfaces. As with the lime treatment described earlier, control is normally by use of the Langelier index.

Waters having predominantly calcium noncarbonate hardness can be treated more economically by zeolite than by lime and soda softening, as it is less expensive to remove this type of hardness by salt than by soda ash. If the hardness is mostly in the

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form of calcium bicarbonate, lime softening will normally cost less.

Where considerable magnesium hardness is also present, lime treatment is likely to be more economical due to its ability to remove calcium selectivity, whereas zeolite removes both calcium and magnesium.

A third form of treatment for control of scaling consists of reduction of alkalinity by acid treatment alone, with no softening. This process is applicable to moderate-hardness, high-alkalinity waters requiring no clarification. Treatment cost is often less than for softening, and equipment cost will definitely be less. Here again the Langelier index serves as a guide to the control of the treatment.

Since straight acid treatment increases the sulfates, and does not reduce calcium, care should be taken that the circulating water does not contain calcium sulfate in excess of the solubility limit of about 1,500 to 1,800 p.p.m.

Prevention of Corrosion

It is evident from the discussion of scale control that elimination of all scale may be undesirable where ferrous heat exchange surfaces are used. The "controlled scale" treatment is widely practiced for protection of such equipment, the aim being to lay down a uniform thin film of dense calcium carbonate scale in all parts of the system.

Any of the forms of scale control described, except complete zeolite softening, are applicable. Control is based upon the Langelier index, but it is well to point out here that the index is by no means an infallible guide. Presence of organic inhibitors, oil, or excessive suspended matter may result in formation of porous scale giving little protection, or may even inhibit all scale formation, leaving metal surfaces bare and subject to corrosive attack by the oxygen in the circulating water.

The marble test for calcium carbonate saturation is sometimes employed as a guide rather than the Langelier index, for although it is somewhat cumbersome and time consuming, it reflects the effect of inhibitors on scaling tendencies.

In applying the controlled scale method, it is undesirable to attempt to carry either the calcium hardness or the alkalinity at a very low figure, since a small change in either one may upset the control.

It is desirable to maintain a number of test pieces of steel pipe at various points in the cooling system, which can be inspected frequently for excessive scaling or corrosion, as a check on the effectiveness of treatment.

The controlled scale method of corrosion prevention is low in cost, as compared to other methods, and is actually a double-barreled form of treatment, since it also avoids excessive scale formation.

Where it is essential that ferrous heat exchange surfaces be kept entirely free from scale and at the same time be protected against corrosion, the use of chromate as an inhibitor is frequently practiced.[7] A concentration of about 300 to 500 p.p.m. of sodium chromate maintained in the circulating water forms a uniform thin barrier between the metal and the oxygen in the water. This treatment is also used in some plants having alloy heat exchange equipment, particularly where high salt concentrations are encountered.

Chromate treatment is relatively expensive due to the high concentration required, particularly in open systems having a large percentage of makeup.

Since oxygen is the primary cause of corrosion deaeration represents a straightforward approach to the problem. Cold water deaeration is accomplished in a vacuum deaerator,[8] consisting of a closed steel tank having a spray distribution system for the entering water at the top, below which is located either wood slat or Raschig ring filling which breaks the water up into thin films and provides sufficient detention time. A vacuum of about 28 in. of mercury is maintained within the deaerator, usually by multistage steam jet ejectors although for the smaller units a vacuum pump may be used. Oxygen is reduced to 0.25 to 0.50 p.p.m. or less, depending upon water temperature,

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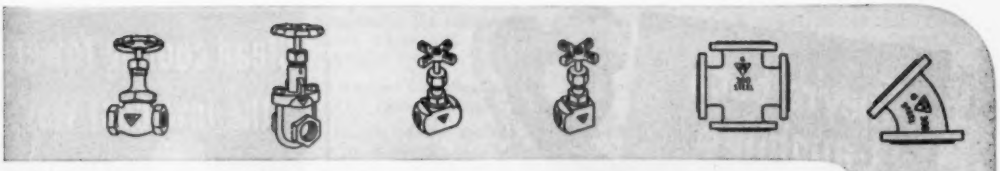

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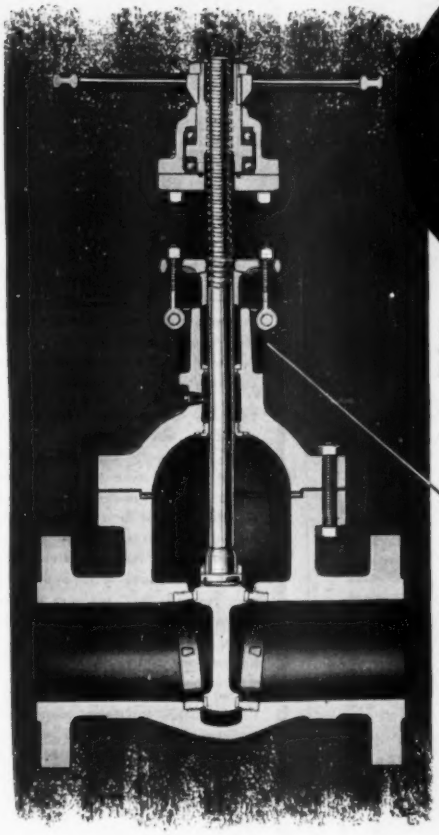

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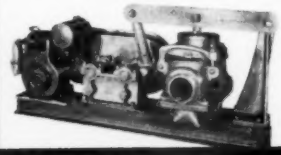

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ejector capacity, and filling height. At these concentrations, corrosion rates are greatly reduced.

The aerating effect in the cooling tower saturates the water with oxygen, therefore the vacuum deaerator must be designed to handle the entire circulating flow. The investment for the deaerator thus becomes appreciable for high circulating rates, but deaerator capacities of 5,000 to 10,000 g.p.m. are not uncommon. Cost of operation will usually compare favorably with other methods.

Sodium sulfite is commonly used following deaerating or open heaters in boiler plants, to take up residual oxygen. However, the reaction between commercial sulfite and oxygen is slow at cool water temperatures, and it is thus not practical for cooling-water deaeration. Recently, catalyzed forms of sodium sulfite have been developed which react rapidly with oxygen at cool temperatures. Cost appears to be the main limitation of this treatment, since sulfite requirement is about 10 parts per part of oxygen.

Oxygen corrosion proceeds more rapidly at low pH values, therefore use of an alkali to raise pH is indicated in the case of low alkalinity raw waters. Lime is commonly recommended for this purpose, due to its low cost and the fact that it also raises the calcium hardness, thus permitting application of the controlled scale method in the reverse direction, so to speak.

Slime and Organic Matter

Chlorination is commonly used for control of organic slimes which coat heat-transfer surfaces and clog cooling towers. Chlorination may be either continuous or in intermittent slugs, the latter often being favored since it results in less loss of chlorine by aeration in the tower, and the sudden high concentrations prevent algae or other organisms from developing a tolerance to the chlorine.

Copper sulfate has been used, and may be effective against certain strains of algae particularly resistant to chlorine. It is not lost due to aeration in the tower, but its use is limited by the fact that the copper precipitates at pH values of 8.5 or over.

Phenolic and quaternary ammonium compounds, which are not removed by aeration or precipitated at high pH, have been used with success in a number of instances.

Miscellaneous Chemical Treatments

Polyphosphates and glucosates, singly or in combination, are used in a number of cooling water installations, for prevention of both excessive scaling and corrosion. Satisfactory protection is reported in some cases, while in others results have not met expectations.

There is evidence that the polyphosphates, used in conjunction with controlled scale treatment, permit somewhat greater ease of control by broadening the range of the Langelier index which may be carried without excessive scaling.

Treatment Modifications for Closed or Once-Through Systems

In the closed system, where little or no concentration takes place, and makeup is small, it is customary to provide treatment which will prevent as completely as possible either scale or corrosion. One hundred per cent zeolite softening, or even demineralizing for removal of essentially all dissolved solids, plus chromate or catalyzed sodium sulfite, is generally recommended for such systems.

Once-through systems, on the other hand, are usually given a limited degree of treatment, due to lack of concentrating effect and because of the tremendous flow rates involved.

Clarification of the more turbid supplies, acid treatment of scale-forming waters, lime treatment for increasing pH of corrosive waters, or polyphosphate treatment of waters which are moderately scale forming or corrosive, are the types of treatment most often used for once-through systems.

Deterioration of Cooling Tower Wood

Chemical attack of the wood of cooling towers[9] results in a condition known as delignification, leaving the wood in a stringy condition, having little or no structural strength.

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for this condition are still incompletely understood, and careful study of the problem is being undertaken by the cooling-tower manufacturers, there is evidence that delignification may be due to high concentrations of sodium carbonate, which are most likely to occur in parts of the tower where the wood is alternately wet and dry.

A survey of this condition at a number of our cooling-water-treatment installations disclosed that although a majority of plants having 100 to 400 p.p.m. sodium carbonate alkalinity in the circulating water had experienced wood deterioration, there were other cases where similar alkalinities were present and no trouble of this sort had occurred. Among those where attack had taken place, there were some showing characteristics of rot due to fungus.

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Gas Injection at Buena Vista Hills

(Continued from page 120)

ing operations were completed in December 1946, 160 wells were producing and, of these, 132 were flowing and 28 were pumping. The decline in the number of flowing wells is a result of high-gas-oil-ratio wells being shut in and edge wells ceasing to flow. Before gas injection was started, the remaining flowing wells were rapidly approaching the stage where artificial lifting facilities would be required. Had the pool pressure continued to decline, several wells soon to be enveloped by the expanding gas cap probably would have ceased to flow, requiring temporary lifting facilities. In addition, artificial lifting equipment would have been needed for long periods by wells located low on the structure. At the start of gas injection, 64 wells were flowing, 41 were pumping, and 79 wells were shut in principally because of high gas-oil ratios. As of January 1, 1951, 65 wells were flowing, 46 were producing by artificial methods, 69 were shut in, and 4 were on gas injection.

Subsequent to gas injection a program was initiated to test shut-in wells located in gas-cap areas where drainage was still occurring. The effect of this program on the status of wells is reflected in the curves on Fig. 16 showing the number of wells producing, flowing, and shut in. In addition to the test program, 11 wells, previously shown as shut in, were recompleted flowing in the E-1 sand during the latter half of 1950. The effects of gas injection on the number of wells pumping was not noticeable until July 1950. During the interim period from the start of gas injection to July 1950, several additional pumping units were required by wells located low on the structure not yet influenced by the pressure-maintenance program. Since July 1950 the expanding gas cap has caused several pumping wells to resume flow.

During December 1950 the pool production averaged 22,540 bbl. per day of oil, 8,938 bbl. per day of water, and 19,199 M.c.f. per day of gas, at a gas-oil ratio of 852 cu. ft. per bbl. Injected gas during this period averaged 22,555 M.c.f. per day. Table 2 is a recapitulation of the cumulative production and injection data to January 1, 1951.

TABLE 2—SUMMARY OF TOTAL WITHDRAWALS AND RETURNS

Cumulative oil production, bbl.	66,189,000
Cumulative water production, bbl.	13,331,000
Cumulative gas production, M.c.f.	31,330,000
Cumulative gas injected, M.c.f.	7,321,000
Cumulative produced gas-oil ratio, cu. ft./bbl.	473
Cumulative net gas-oil ratio, cu. ft./bbl.	363
Cumulative water cut, per cent	16.8

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combats lost circulation of drilling mud

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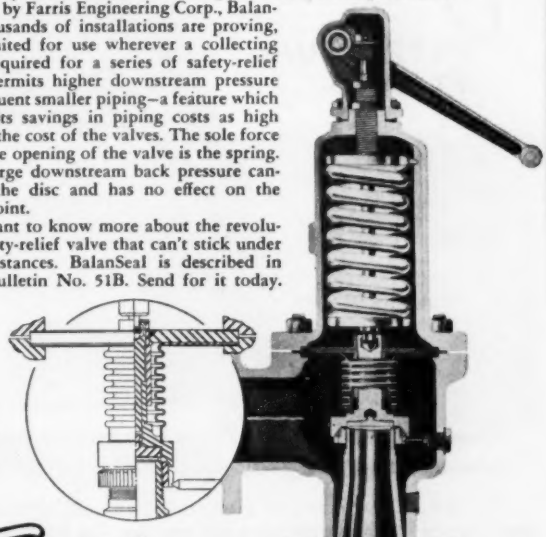

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L.P.G. Production

(Continued from page 129)

its relationships with the automotive industry. In this capacity, the adequate design of L.P.G. engines and equipment should become increasingly important.

Divergent Interests

Petroleum companies engaged in refining will vary greatly in their direct interest in the increased liquefaction of L.P.G. On one end of the scale will be found the company with large supplies of either crude oil or natural gas, or both. On the other end of the scale will be found the company with small supplies, particularly of natural gas. Conditions for individual refineries will, of course, vary more than for the refining companies themselves. Regardless of the direct interest each may have, all should be interested in a development which, in the course of the next 10 years, may lead to this fuel's filling more than 20 per cent of the demand for gasoline.

Conclusion

In conclusion, the authors have presented a rather detailed analysis of past trends relating to L.P.G. The commodity has developed at a very rapid rate, and has now reached a size where maintenance of past rates of growth, or even of somewhat reduced rates of growth, will have very substantial repercussions on all branches of the industry. The most consistent trend of all is the "marketed production" of L.P.G. At this juncture, it does not seem likely that the past uses of L.P.G. can keep pace with a continuation of the past rate of growth of production.

Inasmuch as there are very strong economic incentives for the production trend to continue, or even to accelerate, it appears inevitable for the commodity to seek large new markets. To many it appears that the use of L.P.G. as a direct motor fuel will provide the large new markets. Such a development would be a substantial contribution in the conservation of our liquid-fuel supplies and, if sufficiently accelerated, could be of pronounced value in the mobilization program of the petroleum industry.

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Sulfur-Conversion Plant

(Continued from page 130)

at about 5 psig. A displacement-type level control and blowout valves permit automatic operation of the unit.

Flue gas from the waste-heat boiler are merged with the remaining two-thirds of the incoming acid gas and the mixed stream passes to the catalytic reactor. This fixed-bed vessel measures 7 ft. o.d. by 10 ft. 10 in. tangent-to-tangent and is equipped with a 3-in. monolithic refractory lining. The reactor holds a 12,000-lb. charge of aluminum oxide catalyst. The vessel is fabricated for a design pressure of 15 psig. and a design temperature of 650° F.

Conversion products in the form of sulfur and water vapors, together with the inerts in the acid gas charge, pass to a battery of four atmospheric sulfur condensers installed in series. Each multiple-pipe-type, air-cooled exchanger comprises 20 parallel 3-in. carbon-steel tubes. Each vertical tube contains a ½-in. steam line to pro-

vide temperature control in initial operation.

The condenser tubes are installed in-line, between two horizontal manifolds. Incoming vapors pass upward in parallel flow through the tubes of each exchanger. Proper temperature control permits the condensation of sulfur vapor, and uncondensed water vapor plus inert gases from the fourth exchanger are vented in a stack extending to a height of 46 ft. above grade.

Liquid sulfur condensed in each exchanger collects in the bottom of the lower manifold and flows by gravity through vertical downpipes extending to the bottom of a 5-ft. o.d. by 40-ft. insulated liquid sulfur storage tank equipped with an internal steam coil. This horizontal steel drum is mounted at a sufficient elevation above grade to permit gravity loading of the liquid product to tank trucks.

Air for the waste-heat boiler will be supplied by a cycloidal type, 12-in. by 18-in. blower designed to operate at a shaft speed of 500 r.p.m. and deliver 1,400 cu. ft. per minute at 4 psig. The blower will be powered by a 30-hp. steam turbine.

Operating Conditions

The new sulfur plant will be readily integrated into Lion's gas-treating operation at Magnolia. Since 1939 the company has contracted for Shell's residue gas which averages about 14 million cubic feet per day. From this volume, approximately 900 M.c.f. per day of hydrogen sulfide and carbon dioxide is separated in a conventional Girbotol plant. A small volume of sweetened gas is returned to the Shell plant for fuel, and the remainder is compressed and pipe lined to El Dorado for fuel and petrochemical uses.

The acid gas passing to the sulfur-recovery unit will average the following composition for normal operations:

Component—	Volume per cent
Hydrogen sulfide	30.2
Carbon dioxide	68.0
Hydrocarbons and inerts	1.8

At a total daily input of 900 M.c.f. of acid gas at 100° F. and 10 psig. the new plant will produce 10.4 short tons of 99.8 per cent purity elemental sulfur per day within an allowable 10 per cent margin. Based on previous experience, the designer estimates that the plant will recover a minimum of 89 per cent and a maximum of 92 per cent of available sulfur, depending on the operating variables at the plant.

Plant Economics

The entire plant is designed for out-of-doors mounting, thus minimizing construction costs. Due to the installation of controls, the operation will be entirely automatic. This will permit its integration with the existing gas-treating facilities and will require no additional operators.

Operating requirements for the 10-ton plant are estimated as follows:

Boiler feed water at 212 F.: 4 g.p.m.
Steam 250 psig.: 1,200 lb./hour.
Labor: 2 man-hours per day.
Instrument air (35 psig.): 10 cu. ft./minute.
Electric power: 2 kwh./hour.

The cost of transporting product sulfur to El Dorado will be negligible. Since the storage tank will hold 4 days' production, daily runs will not be necessary. The liquid may be loaded by the driver. A conventional semitrailer truck of the type used for transporting petroleum products will be used in the operation. In view of the short haul, no provisions for heating the truck tank will be necessary to keep the sulfur in liquid form.

Although the economics of this new operation are supported by a number of advantages peculiar to the case, Lion's decision to build this small plant to operate on a low-H_2S-content acid gas indicates that recovery of much-needed sulfur from sour gas need not in all cases be contingent on a large source of acid gas. Lion's case may be considered as comparable to that of some refineries where operation of a small sulfur plant on refinery acid gas might prove feasible when integrated into existing facilities.

Total production of the new unit

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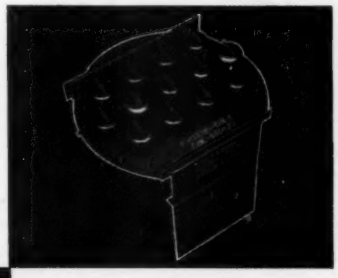
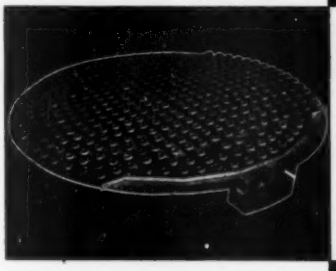




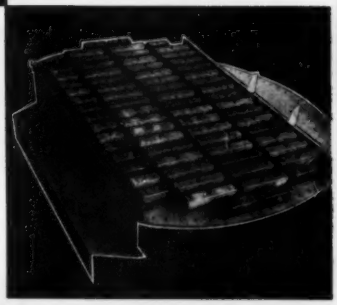
▲ GLITSCH Bubble Tray with wedge type bubble cap holddowns for 2'-6" diameter I. D. Tower, and is made from carbon steel material.

◀ GLITSCH Bubble Tray with de-pressed or streamlined caps is 16'-6" in diameter, and is made from 12% chrome type 410 stainless steel.

▼ GLITSCH Bubble Tray with rectangular bubble caps is 9'-0" diameter, and made from 18-8 type 304 stainless steel.

GLITSCH "Truss-Type" Bubble Trays can be utilized for any process requirement with respect to tray size, layout and type of flow, shape and type of downcomer, weirs, wells, risers, bubble caps—and, more recently, integrated vessel units.

Fritz W. Glitsch & Sons, Inc. will mechanically engineer and fabricate a GLITSCH "Truss-Type" Bubble Tray to your individual process requirements.



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Urged on and on by the incentives afforded by our free enterprise system—Americans, with the private money of thousands of stock holders, have built a Bulwark of Steel greater than all the rest of the world.

The capacity of America's steel industry is so great that in 24 hours, it can turn out ingots and castings sufficient to provide finished steel for—500 airplanes, 500 tanks, 1,000 anti-aircraft guns, a half million 3-inch shells, 1,000 howitzers, 2,000 aerial bombs, 1 aircraft carrier, 2 heavy cruisers, two cargo ships, two tankers, 1,000 freight cars, 2,000 trucks, 12,000 automobiles, 20,000 refrigerators, 20,000 stoves, 2,000 homes, and still have 23,000 tons of steel for other purposes.

Remove the incentives of free enterprise or burden it with excessive restrictions and our magnificent steel industry will be vulnerable to the wasting erosion of socialistic rust.

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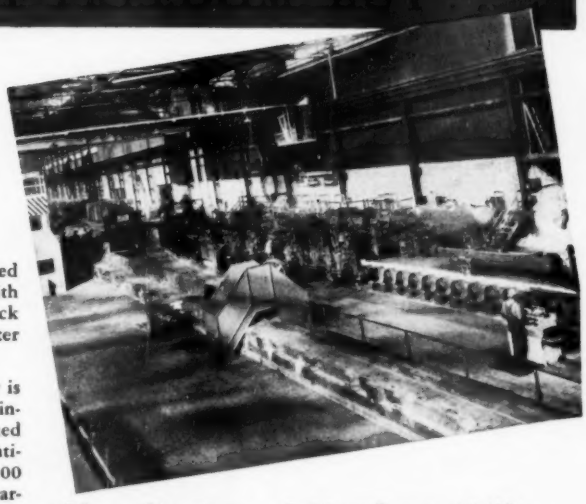

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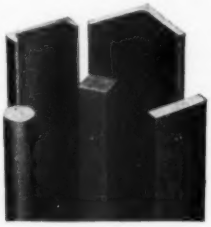
On this highly mechanized 12-inch merchant mill, steel billets are more efficiently rolled into a wide variety of merchant shapes and sizes vital to manufacturing.

It is a typical example of the continuing modernization and expansion program of Sheffield Steel which, in the last ten years alone, has more than tripled the at-home steel making capacity of Sheffield Steel mills. New furnace and blooming mill capacity now under construction will enable Sheffield Steel to continue to pace industrial progress with an ever increasing supply of steel—the vitamin A of industrial growth.



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There are few industries that do not use merchant steel. Sheffield Steel mills roll a wide variety of bars and shapes.

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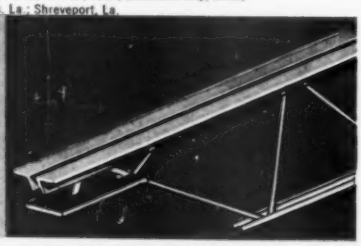
The design and construction of Sheffield Steel Joists makes possible the supporting of more floor or roof area per ton of material in many types of structures.



Sheffield Products: Carbon and Alloy Steel, Ingots, Blooms, Billets, Plates, Sheets, Hot Rolled Bars, Steel Joists, Structural Shapes, Reinforcing Bars, Welded Wire Mesh, Wire Products, Wire Rods, Fence, Spring Wire, Nails, Rivets, Grinding Media, Forgings, Track Spikes, Bolt and Nut Products

MORE SCRAP MEANS MORE STEEL • TURN YOURS IN TODAY!

will be absorbed by Lion. The 10 tons per day will represent but 10 per cent of the total daily requirements for elemental sulfur which can be converted to sulfuric acid in a new contact unit at the El Dorado chemical plant. The new acid unit, like the original Lion chemical plant and the other units added later, was designed and constructed by Chemical Construction Co. of New York.

Worland Field

(Continued from page 137)

ized-steel stock tanks were contained in these batteries.

The vapor system on Worland tank batteries was designed to serve a threefold purpose: prevent escape of toxic gases to the atmosphere; reduce losses in oil gravity and volume through maintenance of a 2-oz. pressure in the tank; prevent air from entering tanks by maintaining a sweet-gas blanket. A district fuel-gas system distributed purchased sweet gas for this and other field requirements. By excluding air from the tanks, the possibility of a tank explosion from spontaneous ignition of iron sulfide is minimized.

The two-way valve on the vapor-outlet connection from each tank was normally open to the main vent line on which a regulator maintained a 2-oz. back pressure. A sweet-gas-supply regulator that was set for approximately 1¾-oz. fed sweet gas into the main vent line at times when tank pressure dropped below the 2-oz. sour-gas venting pressure.

Before opening the thief hatch to gage a tank, pressure in tanks was reduced by operation of the two-way valve lever which closed the main vent line and opened the sour-gas bypass line. This isolated the tank and minimized the escape of vapor from the tank when the hatch was opened. As a further precaution, the hatch cover cannot be lifted until the valve is opened to the bypass line. Proper operation of the system was checked by the manometer installed near the hatch.

The shop-made separator further reduced gassing in the tanks by venting directly the vapors that came out of solution when the pressure was reduced from 50 psig. to 2 oz. Oil from this unit gravitated to the stock tank.

To provide additional protection for personnel working around tank batteries, tank walkways were provided with double stairways to permit exist from either end. Field regulations require that any person going onto a tank walkway must wear a gas mask and that a second party equipped with a gas mask remain at the fire wall. Consequently in the event of an emergency, help was available immediately. As the chance for survival after being gassed by hydrogen sulfide is a direct function of the time of exposure to the concentrated fumes, immediate evacuation from the contaminated area is of the essence. The standard oil-field canister-type mask did not prove satisfactory as it is effective against a maximum hydrogen sulfide content of 2 per cent.

Although oxygen-generating canister-type masks have been used and are available for an extreme emergency, their effective use was limited in that several breaths in uncontaminated air are required to start oxygen generation; the unit is bulky; and once the expensive canister is opened, it cannot be used intermittently over long periods as the chemicals deteriorate in a short time.

The fresh-air-type mask was adopted and has proved satisfactory for all usage. Air is provided to the face piece through a reducing regulator from a high-pressure cylinder that is mounted on a harness carrier so the cylinder is carried on one's back. A pressure gage warns the user when the air supply is reaching depletion. Small individual cylinders are filled from three major fresh-air cylinder batteries in the field.

Two complete mask units are assigned to each switcher pickup truck. Each switcher is furnished with a personal face piece. Resuscitator units are maintained at the same locations as the fresh-air batteries. Oxygen therapy units, gas masks,

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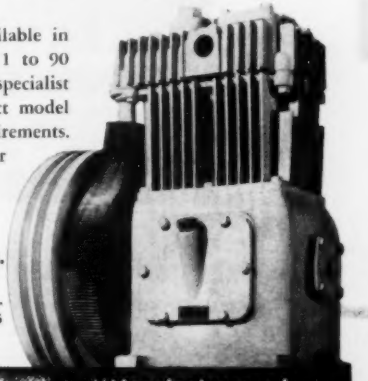

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CANADIAN OIL'S NEW 20,000 B/D REFINERY IS INSTALLING 4,000 B/D PLATFORMING UNIT

By E. A. Smith
Manager of Manufacturing
Canadian Oil Companies, Ltd.

Early in 1952 Canadian Oil Refineries, Ltd., a wholly-owned subsidiary of Canadian Oil Companies, Ltd., will have completed and placed into operation at Froomfield, Ontario, just four miles south of Sarnia, a completely new $18,000,000 refinery. This modern plant will contain processing facilities which represent the finest in advanced petroleum refining techniques.

E. A. Smith

The major processing elements which are being erected in the new refinery are:

(a) 20,000 barrel per day atmospheric and vacuum distillation unit, with vis-breaking;

(b) 10,000 barrel per day orthoflow catalytic cracking unit, gas concentration system, and UOP catalytic polymerization unit;

(c) 4,000 barrel per day UOP Platforming Unit.

Plant storage will be upwards of 2,000,000 barrels.

The decision which prompted construction of the Froomfield refinery was influenced in major part by the following factors:

1. The growing inadequacy of our 4,000 b/d refinery at Petrolia, which has been in continuous operation since its origin in 1900 and is nearing obsolescence, to meet the increasing requirements for more and higher quality petroleum products.
2. The complexity of the crude oil supply situation. During the early years, Petrolia refinery had been dependent on the Petrolia-Oil Springs field which rapidly diminished in production. Mostly we have been dependent on the U.S. for supplies. It is interesting to note that although the once rich Petrolia-Oil Springs fields were discovered almost simultaneously with discovery of the Pennsylvania field in 1859, they are still in active, although meagre, production.
3. The location in Sarnia and close coordination of the Froomfield project with that of the great Polymer Corporation, a Canadian Government company, which requires large quantities of refinery ingredients for use in the manufacture of synthetic rubber. Polymer is considered to be one of the world's finest completely integrated plants. It is also the only synthetic rubber plant built and operating in the British Empire.

4. Access to an adequate and assured supply of Canadian crude oil from the Alberta fields. Redwater crude for the new Froomfield refinery will be delivered by the Interprovincial Pipe Line from Edmonton to Superior, Wis. Tankers will then transport the crude to refinery storage.

Our Froomfield plant will tie in operations with that of the Polymer Corporation and another large chemical organization as follows: Canadian Oil will supply them with a butylene stream and a tail gas stream of C_2 and lighter, from which they will extract ethylene and ethane and crack the ethane into ethylene. An LPG stream of propane will be supplied, which also will be cracked into ethylene. The propylene incident to the pyrolysis of ethane and propane will be returned to Froomfield for polymerization, along with our own propylene stream. This will thereby make up, in large measure, the deficit of poly gasoline occasioned by the release of butylenes to Polymer.

The selection of the UOP Platforming process for Froomfield was made after our engineers had completed studies of the various reforming processes now in operation and some of which were still in the pilot plant stage. We supplemented our studies on Platforming by journeying to Muskegon, Michigan, to witness at first-hand the commercial operation and performance of the Old Dutch Refining Company Platformer, the first industrial or full-scale unit built.

We were convinced, after carefully weighing all of the factors involved, that for our particular operation Platforming was indeed the superior reforming process.

The guaranteed charging capacity of the Platformer is 3800 b/sd. Engineering and construction of the unit is under the direction of Procon Incorporated.

At the present time provisions are being made to charge a stream of 250°-400° F. straight run naphtha to the Platformer. We estimate that 60% of the Platformate which is realized from this operation will be available, for defense purposes, as aviation gasoline base stock. Consideration also is being given to providing a narrow cut of light straight run as charge to the Platformer for the production of benzene, which is in short supply. This will particularly be the practice when the Government requires portions of the 250°-400° F. naphtha for aviation jet fuel.

In designing the refinery, full cognizance was given to Canada's great defense effort, in which our operations at Froomfield are destined to play a prominent part.

Canadian Oil Companies, Ltd. is, and Canadian Oil Refineries will be, completely owned, staffed and operated by Canadian personnel. Refinery products are marketed through an organizational distribution set-up that extends from the Atlantic to the Rockies. The products are marketed under the trade name of "White Rose." The home office of Canadian Oil is located at 204 Richmond Street, West, Toronto, Ontario.

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Universal Service Protects Your Refinery

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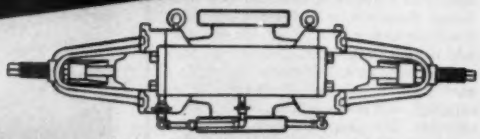
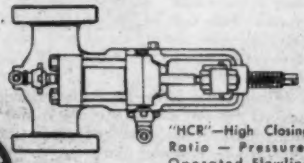
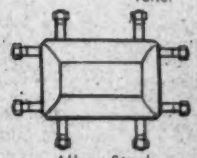


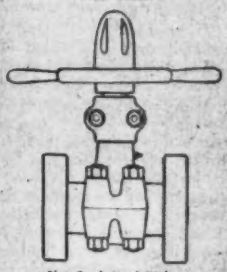
"QRC" — Quick Ram Change — Pressure-Operated Blowout Preventer.



"HCR"—High Closing Ratio — Pressure-Operated Flowline Valve.



Alloy Steel Mud Cross.



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face pieces, cleaning solutions, and replacement filters are kept at switchers' doghouses. Personnel are further guided by safety instructions.

Material Failures

Various types of equipment have failed in service in Worland field; however, these failures cannot be attributed only to corrosion from sour well fluids. Rather, it is believed that the failures are caused by a combination of causes such as hydrogen embrittlement, stress caused by extreme temperature change, cold embrittlement and hydrate formation around movable parts.

Failure of tubular goods has caused a great deal of trouble and expense to operators. This type failure was indirectly responsible for the fire at 1-E Unit; and failure in other wells have necessitated workover jobs and prolonged rig time.

Although the majority of breaks have been in tubing couplings, a series of failures occurred in one 5-in. circulating string. These failures varied from open breaks to lines of cleavage along the plane of the tubing. As many as eight specific breaks have been found in one 10,000-ft. string of tubing. Additional failures have occurred in surface flow lines where tubing is used between the well and heaters.

Repeated laboratory investigations of broken pipe have failed to reveal active corrosion and no definite conclusions have been drawn as to the cause. However, the combined effects of thermal stress induced by the circulating system operation, and probable hydrogen embrittlement cannot be disregarded as a possible cause. Tubing was made up with jaw tongs in the early days of the field and it was believed that tong marks could be the origin of some failures. Friction tongs were adopted for use to eliminate this possible cause of trouble.

An excessive amount of breakage occurred in stems of well-head gate valves. It was believed that this was the result of the factors mentioned. Stainless-steel alloy valves were used in an attempt to alleviate this situation; however, some breakage of alloy stems still occurs. The field procedure of applying heat from a portable valves has further reduced breakage. This procedure is particularly adaptable in cold weather when atmospheric conditions tend to aid hydrate formation. Failures of wire lines, gages and steel springs have been discussed previously.

Gas-Oil Gathering System

The main lines of the gas-oil gathering system were geographically located so as to require a minimum number of laterals and where necessary, provide minimum-length laterals. To facilitate this design, the system was broken down into an east and west leg with a junction near the gasoline plant. Operationally the line was designed for a pressure drop of 5 psig. per mile when either leg was conducting a sufficient quantity of gas and oil to load the plant. This resulted in main-line sizes varying from 5½ to 16 in. in diameter. The system is of all-welded construction, coated and wrapped, and provided with cathodic protection.

The line was laid to grade as nearly as possible to minimize liquid accumulations and consequent uneven gas volume delivery to the plant. Winter subsurface temperature surveys indicated the desirability of burying the lines with a minimum of 5 ft. coverage. To arrive at this coverage in the irrigated section of the field it was necessary to dragline the ditches as the high-water level caused caving of work done by a conventional ditcher. Specially cast concrete blocks were positioned on 10-in. and larger pipe in this area to prevent possible floating.

Pipe failures occurred on two extensions to the original system. After withstanding a 750-psig. cold water test, leaks developed in 7-in. sections placed in service at considerably lower pressures. The failures were found to be transverse splits ¼ in. to 1 in. behind the weld. Repair welds were annealed by post heating. Several

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For detailed information on this modern method of coalescing and removing liquids entrained in the vapor in vacuum pipe stills, scrubbing towers, knockout drums, evaporators and similar equipment, write for your copy of our 8-page bulletin — "Metex Mist Eliminators".

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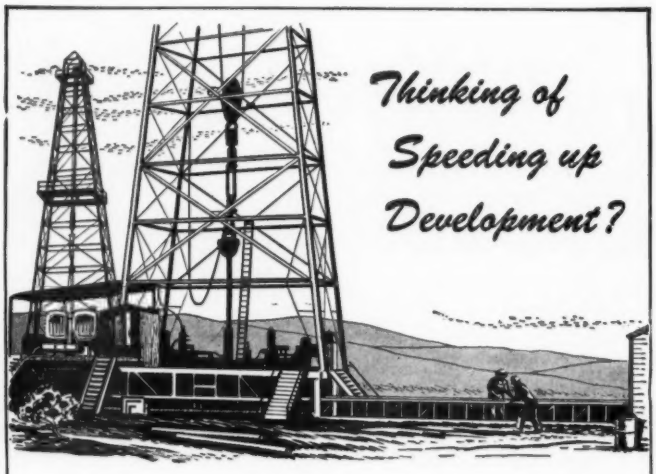
additional weak spots were found by testing the line with hot water at high pressures.

A suspension bridge having a 360-ft. span was erected across the Big Horn River to serve as a combination foot bridge and pipe-line crossing. The exposed portions of the 13⅜-in. o.d. Embar system on the west side earthen fill and on the bridge are insulated with hair felt and roofing paper. From an expansion bend on the east side of the bridge, the line loops down to below ground level and continues on an upgrade to the plant. This is the main exception to the grade of the system.

Trouble with hydrate plugging has occurred in the system. Before the crude-stabilization plant was in operation, attempts to move gas alone were generally unsuccessful because of hydrate plugging. This in part could have been the result of some water remaining in the lines after testing and the necessity to backfill a part of the ditch with frozen ground. The line was not kept continuously open until oil was brought in with the gas. Later plugging has occurred in temporarily dead sections of the system where block valves apparently permit some gas to leak by.

A pressure-relief valve set at 400 psig. with discharge to a flare is provided on each leg of the system.



Thinking of Speeding up Development?

Producers of oil and natural gas are invited to consult with our Oil Department for aid in financing *accelerated development drilling programs.*

All inquiries on petroleum and related matters will receive prompt attention.

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Plant Operations

An agreement was made between Pure Oil Co. and Texas Gulf Sulphur Co. whereby Pure would deliver sour gas produced from the Embar reservoir to a plant to be built and operated by Texas Gulf Sulphur for the recovery of commercially pure sulfur from hydrogen sulfide gas. The sweetened gas would be returned to a conventional absorption plant to be built and operated by Pure for recovery of L.P.G. and natural gasoline. Through an agreement with Montana Dakota Utilities, available residue gas from this plant was purchased for its distribution system. The Embar gas-oil gathering system was constructed as the service flow line for the Pure and T.G.S. plants.

Installation of this system marked the major change in producing operations because upon completion of the plants, oil was no longer recovered in well tank batteries. Instead, wells were produced directly into the gathering system operating nominally at 325 psig.

Oil and gas were moved together in a common line to separators at the gasoline plant. The gas from these separators made up the high-pressure stream to T.G.S. The oil went directly to the crude-stabilization section of the gasoline plant which serves to remove hydrogen sulfide from the oil leaving essentially a sweet oil; recover as liquid hydrocarbons those light ends that would normally be lost in atmospheric storage; and treat oil to pipe-line specifications. The stainless-steel-lined crude stabilizer tower operates at 140 psig. and is 48 in. in diameter by 67 ft. high. The stabilized crude is run to central storage facilities for later transportation to refining centers. Gas from the stabilizer makes up the low pressure stream to T.G.S.

The high and low-pressure sweet-gas streams returning from T.G.S. are processed directly in 250 and 60-psig. absorbers at the gasoline plant for recovery of natural gasoline and L.P.G. Available residue gas from the high-pressure stream goes to the MDU compressor plant for boosting to northern markets. Residue gas from the low-pressure stream is used for field fuel requirements.

During the first period of operation four operators, Pure, Trigood, Sharples, and Carter, partially developed their leases and were obligated to drill and produce offset wells that were not structurally located to recover oil at the lowest gas-oil ratio. It was realized that unitization was the only solution that would allow selective production of the field to secure maximum oil recovery. Consent of all working-interest owners and royalty owners was obtained; and working agreement permitting total unitized operation of the field and gasoline plant with Pure Oil Co. as operator became effective May 1, 1950.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Eastern vs. Western Lubricating Oils

I am writing to ask you the advantages and disadvantages of both paraffin-base and asphalt-base motor oils. R.M.

There are two major properties by which raw stocks for the manufacture of lubricating oils are judged, namely, pour point and viscosity index. Pour point is the low temperature at which the oil will not flow or move perceptibly during a time of 5 seconds. If the pour point is —0° F., the stock merits consideration because the very expensive operation of dewaxing is unnecessary. However, if the oil is very thick at low temperatures but becomes thin at high temperatures (a low viscosity index), it is not considered as a satisfactory lubricating oil stock even if the pour point is low. Large amounts of naphthenic or asphalt-base lubricating oils having pour points of zero and viscosity indexes of 25-40 are produced. These lubricating oils have, to a mild degree, the property known as "detergency" which means that they tend to keep sludge, carbonaceous material, etc., in suspension and thus keep the pistons and cylinders relatively clean. This property can be obtained, perhaps more satisfactorily, by the addition of detergency additive (often metallic soaps) to the other types of lubricating oils.

Good Viscosity Indexes

Intermediate (mixed), paraffin, and Pennsylvanian base lubricating oil stocks all contain so much wax that they must be dewaxed. However, they have increasingly good viscosity indexes:

Intermediate base	40-86
Paraffin base	92-113

Viscosity indexes below about 75 are considered as inferior but note that the viscosity of oils of even 100 v.i. changes markedly with temperature. A very small production of oil in Pennsylvania probably accounts for the term Eastern oils, and at one time the oils produced in California were naphthene base and these were called Western oils. At the present time, 17 major fields in Arkansas, Louisiana, Michigan, Texas, Pennsylvania (counted as one field), and Wyoming produce paraffin-base lubricating oils as well as three fields in Louisiana which produce intermediate-paraffinic lubricating-oil stocks. Meanwhile, naphthene-base oil stocks are produced from 38 major fields, in California (19), Texas (18), and one in Louisiana. In addition, the classification with regard to base is becoming less and less significant because refining methods have been developed by which the asphaltic or naphthenic parts of the lubricating-oil stock can be removed or separated and because chemical agents (additives) have been discovered which can alter the properties of the lube stock. Additives are used to reduce the pour point, increase viscosity index, suppress corrosion, impart detergency properties, reduce the tendency to foam, etc.

Nonadditive Stocks

This paragraph applies to stocks that do not contain additives. Paraffinic lube stocks have a good viscosity index whereas naphthenic lubes tend to thicken at low temperatures. Paraffinic stocks tend to deposit hard carbonaceous deposits but look clean or clear, whereas naphthenic lubes tend (mildly) to keep sludge in suspension and thus soon look dark. Solvent-treated or extracted stocks and paraffinic ones quickly freeze the rings of diesel engines whereas naphthenic stocks are fairly satisfactory for diesels. Some solvent-treated and paraffinic stocks tend to form varnish-like deposits on the piston skirts of spark-ignition engines which under the worst conditions freeze the piston into the cylinder. The several troubles listed here are seldom severe enough to cause serious trouble.

Solvent treating or extraction is now used in the production of about 80 per cent of our lubricating oils, mainly because of cheapness of manufacture. Some plain naphtheic stocks are still produced, primarily because their low pour points makes dewaxing unnecessary.

Effect of Temperature on Products of Thermal Cracking

What conditions of temperature and pressure are required in the formation of aromatic hydrocarbons by thermal methods? R.P.G.

The exact relationships between operating conditions and the percentage production of aromatics is obscured by the effect of pressure (often only a mechanical effect), and by the many different kinds of hydrocarbons that have been used as charge stocks. However, it seems to be clear that the cracking of predominantly saturated (paraffinic or cyclo paraffin) stocks yields mainly olefin hydrocarbons at 1,000°-1,050° F., and that aromatic and diolefin hydrocarbon production begins to be appreciable at 1,200° F. At the same time the splitting off of hydrogen becomes more and more pronounced as the temperature is raised, being almost negligible at 950° F., appreciable at 1,050° F., and substantial at 1,250° F.

Although pressure encourages polymerization, and although the formation of rings from straight chain hydrocarbons is in a sense polymerization, the formation of aromatics in commercial equipments has been found to be most successful when the pressure is relatively low. Thus, aromatization is predominantly cracking or dehydrogenation conducted at relatively low pressures and only secondarily a polymerinzation reaction. This is further substantiated by the fact that the reaction is endothermic as in cracking, not exothermic as in polymerization.

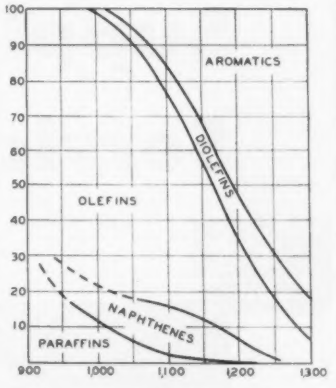

Fig. 1—General types of hydrocarbons produced in thermally cracking low-molecular-weight feed stocks.

Unfortunately, commercial operations at 1,000°-1,125° F. have been practiced mainly on charge stocks that usually contained 19 to 32 per cent of unsaturated hydrocarbons (mainly with 3 or 4 carbon atoms), whereas the stocks cracked at 1,200°-1,250° F. have usually been propane or butane. When cracking such types of charge stocks, the yields of different types of hydrocarbons are somewhat as shown in Fig. 1.

As a further illustration of the effect of pressure, large amounts of aromatics were claimed for the cycloversion (catalytic) process when it was first developed and when it was operated at very high temperatures. Later when the process was conducted at 990°-1,020° F., only small amounts of aromatics were produced and the product became highly olefinic.

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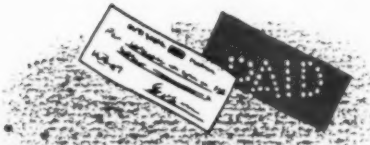

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Corrosion Instruments

3. SOIL RESISTIVITY

THE determination of soil resistivity is accomplished either by measurement made on a small sample or on the soil in place. The sample technique is open to many objections, chief among which are the difficulty of obtaining a representative sample and the difficulty of preserving the sample unchanged while tests are being conducted. The methods which operate on the undisturbed soil, on the other hand, have a tendency to average the resistivity of soils in a region, and may in some cases overlook significant variability in the soil.

To measure the resistivity of the soil over any considerable volume, four contacts with the upper surface are required; these are usually placed in a straight line at equal spacing. If the soil is of uniform resistivity to great depth, then this resistivity, ρ, is given by the expression:

$$\rho = 2a \times E/I$$

where

ρ = the resistivity in ohm-cm.
a = the spacing in cm.
E = the measured potential between the two inner terminals
I = the current between the two outer terminals

If the soil is not uniform, then the value given by the formula represents an average to the approximate depth a.

If direct current is employed in this test, as from a battery, the two potential terminals should be copper sulfate electrodes, to avoid the effects of polarizations. Also, the polarity should be reversed and the average of two readings taken, to eliminate the effects of stray currents which may be present in the soil.

An instrument is available which uses alternating current, producing it by means of a battery-operated vibrator. Instead of measuring the potential and current separately, the effective resistance is obtained by a modified Wheatstone bridge. Balance is indicated by a galvanometer.

Still another variation uses a hand-cranked generator which produces direct current. This is first passed through the current coil of a two-coil indicating meter, and is then converted to alternating current by means of a commutator mounted on the generator shaft, and fed to the two current terminals in the soil. The alternating potential picked up by the other two terminals is rectified by another commutator mounted on the same shaft, and, as direct current, is then passed through the potential coil of the meter already mentioned. The forces set up in these two coils tend to move the needle in opposite directions, so that it comes to rest in a position indicative of the ratio E/I. This instrument is perhaps the most precise of all the commercially available field resistivity meters; it is also the most expensive.

Soil resistivity may be measured, with somewhat less accuracy and to shallower depths, by using only two terminals. The principle used is the same as in the pocket ohmmeter—a fixed voltage is applied, and the amount of current passed is taken as indicative of the resistance. Either alternating or direct current may be used; if direct, then the cathode is made much larger than the anode, in order to minimize the effects of polarization. Instruments of this type are relatively inexpensive and are very rapid in use.

Another variation combines the two terminals into a single rod, using an insulated tip for one and the remainder of the rod for the other. In this way the relative position of the two is held constant. The "rod constant" is determined almost entirely by the area of the tip alone; when the rod is four or five diameters deep in the ground, further increase in the contact area has almost no effect. The better instruments of this type use battery power, converted to alternating current by means of a vibrator. A calibrated slide wire reads directly in ohms; multiplication by the rod constant yields ohm-cm. of resistivity. A pair of headphones is used as a galvanometer to indicate the point of balance.

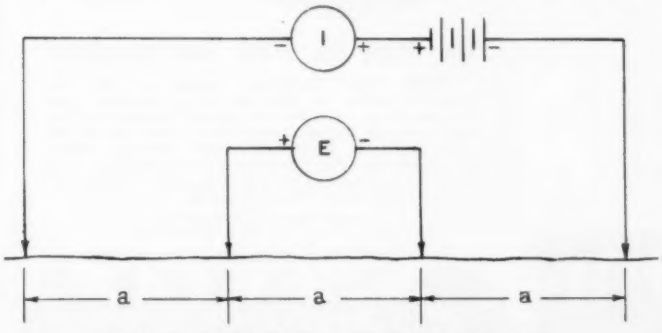

Fig. 1—Four-terminal method of earth-resistivity measurement.

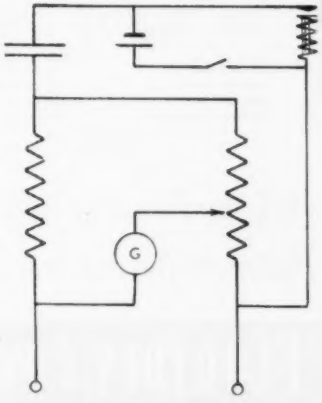

Fig. 2—Alternating-current bridge for use with one-rod soil-resistivity apparatus.

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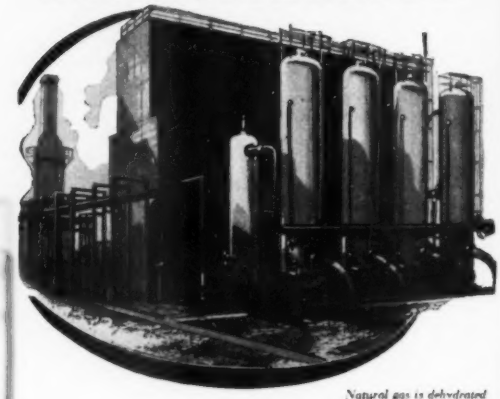

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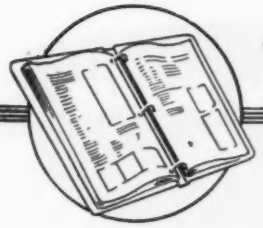

THE REFINER'S notebook

No. 85

Cleanout Openings for Oil-Storage Tanks

by I. E. Boberg* and L. P. Zick†

4. LOAD DIVISION, REINFORCEMENTS

REFERRING to Fig. 1 and assuming that the ring stress given in No. 84 of The Refiner's Notebook carries across the opening, the total load F in pounds to be carried by the reinforcement for an opening h inches high in a shell t inches thick is given by:

$$F = (h - x/2)\,St, \text{ where } x \leqq h$$

or

$$F = (h^2/2x)\,St, \text{ where } x \geqq h$$

Most of the ring stress acting across the opening was found to flow over the top of the opening indicating that the shell and the reinforcement acted as though they were a large C-frame tied across the bottom with a flexible member. The best correlation with test data is obtained when the assumption is made that the load on the upper 0.7 of opening height h is carried by the upper reinforcing and the remaining load on the lower 0.3 of the height h is carried by the lower reinforcement.

From this it follows that F_b and F_t, the total loads in pounds carried by the bottom and top reinforcement respectively, may be determined:

$$F_b = (0.045\,h^2/x)\,St, \text{ if } x \geqq 0.3\,h$$

or

$$F_b = (0.3\,h - x/2)\,St, \text{ if } x \leqq 0.3\,h$$

also,

$$F_t = (h - x/2)\,St - F_b, \text{ if } x \leqq h$$

or

$$F_t = (h^2/2x)\,St - F_b, \text{ if } x \geqq h$$

Shell reinforcing plate thickness.—If the width of the shell reinforcing plate above the opening x is d in inches, its thickness t_s in inches shall be determined from:

$$t_s = F_t/17{,}850\,d, \text{ if } h \geqq x \qquad (1)$$

or

$$t_s = F_t/17{,}850\,(h/x)\,d, \text{ if } h < x \qquad (2)$$

but in no case shall the thickness be less than:

$$t_s \geqq t\,[0.97\,(h/r)^{1/2} - 0.36] \qquad (3)$$

*Chief engineer and †research engineer, Chicago Bridge & Iron Co.

where r equals the upper corner radius of the opening in inches. Also the width d should not exceed h/2 and should not be less than the value given by:

$$d \geqq \frac{0.5\,h}{0.97\,(h/r)^{1/2} - 0.36} \qquad (4)$$

Formulas 1 and 2 are based on the reinforcement area required to accommodate F_t at a unit stress approximately equal to the tank ring stress at height h.

Formula 3 expresses a minimum for t_s based on the effect of the ratio of r to h on the stress concentration as indicated by test results.

Formula 4 simply insures that in no case will the top reinforcement be less than prescribed by A.P.I. Standard 12-C (neglecting participation by door neck).

Derivation of (1), (2), and (4) is obvious. With regard to (3) note that the maximum average strain measured in the combined shell and reinforcing plate occurred at the upper tangent point of the top corner radius of the opening. The first opening tested was similar to an A.P.I. manhole in that the cutout in the shell was larger than the cutout in the reinforcing plate. Yielding was observed at loads within the working range. It was concluded that both shell and reinforcement must be welded to the neck in order to provide additional metal at the edge of the opening where it would do the most good.

Results also indicated that the corner radius of the opening is an important factor. As the ratio of corner radius r to height h increased, the tangent point stress decreased. Note from Formula 3 that if r is equal to h/2, the equivalent of a circular manhole, t_s is equal to t approximately. But for any lesser radius as the opening approaches a square corner, the amount of metal needed adjacent to the neck increases. This was demonstrated by experiment.

Corner Radius Limit

From the standpoint of utility of the opening, there is a desirable limit to r in order to provide as unobstructed passage as possible. Based on experimental results r should not be less than h/3. For the square openings, 4 by 4 ft. and 2 by 2 ft., the recommended radii would be 16 and 8 in. respectively. Formula 3 would then indicate that t_s should never be less than 1.32t. It may be greater if so required by (1) or (2).

For the 3 by 4-ft. wide rectangular opening r can be proportionately larger without greater obstruction. The recommended radius would be 15 in. and as indicated from (3) t_s should never be less than 1.15t.

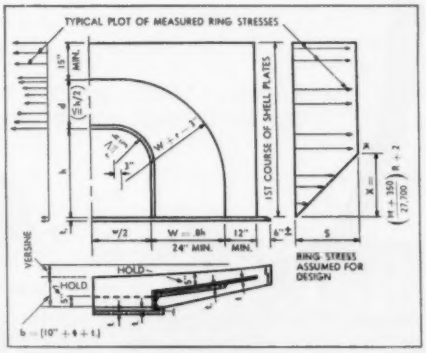

Fig. 1—Design details.

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Pipe-Line Construction

FOLLOWING is a tabulation of pipeline projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. The list was compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Alberta-Vancouver Oil Pipe Line Co. (Brokaw, Dixon, McKee).—972 miles, 16-in., proposed, Edmonton via Pincher Creek, Alta., Idaho and Washington states to Vancouver, B. C.

Derby Oil Co.—15 miles, 6-in., authorized. Wichita to Bentley, Kans. Completion date 1-1-52.

Gulf Refining Co.—64 miles, 10-in., authorized, Eucutta to Lumberton. Completion date 1-1-52.

Gulf Refining Co.—87 miles, 14-in., authorized, Lumberton to Mobile. Completion date 1-1-51.

Interstate Oil Pipe Line Co.—35½ miles, 12-in., under way, New Iberia to Sunset, La. Houston Contracting Co.

Interstate Oil Pipe Line Co.—20 miles, 6-8-in., under way, New Iberia to Weeks Island and Avery Island fields. Houston Contracting Co.

Ohio Oil Co.—117 miles, 22-in., authorized, Sheridan, Ind., to Lima, Ohio.

Phillips Pipe Line Co.—27 miles 8-in., looping from Borger, Tex., to Yale, Okla.

Phillips Ptpe Line Co.—Authorized, Midland, Glasscock, Reagan, and Upton counties.

Platte Pipe Line Co.—1,075 miles, 16-20-in., under way, Worland, Wyo., to Wood River, Ill.

Platte Pipe Line Co.—573 miles, 16-20-in., under way, Worland, Wyo., to Holdredge, Neb. R. H. Fulton & Co. (Sections 1, 2, 3, and 4.—Section 1, 126 mi. of 16-in., remainder 20-in.). A. A. Carrigan, spreadman at Casper, Wyo., field office.

Platte Pipe Line Co.—142 miles, 20-in., under way, near Marysville, Kans., to Holdredge, Neb. Bishop & Lock (Section 5); H. LaQuey, spreadman.

Platte Pipe Line Co.—100 miles, 20-in., under way, northern edge of Kansas. Rumsey Bros., contractor of Section 6.

Platte Pipe Line Co.—(Section 7) 274 miles, 20-in., under way, Missouri River to Salisbury; field office, Carrollton, Mo.; O. P. Hiner, spreadman. (Section 8) Salisbury to Mississippi River; field office, Moberly, Mo.; B. C. Hall, spreadman. O. R. Burden, contractor. Completion date 9-51.

Progress Pacific Pipe Line Co.—900 miles, 20-in., proposed, Permian basin, West Texas, to California.

Service Pipe Line Co.—130 miles, 8-10-in., planned, Old Glory field to Bowie, Tex.

Service Pipe Line Co.—37 miles, 10-in., under way, West Bank Salt Fork Brazos River to Jud Station, Haskell County, Texas. Smith Contractors. Completion date 9-15.

Service Pipe Line Co.—65 miles, 10-in. under way, West Bank Salt Fork Brazos River to Bowie Station, Montague County, Texas. O. R. Burden Construction Co. Completion date 9-15.

Sinclair Pipe Line Co.—674 miles, 22-in., authorized; Drumright, Okla., to E. Chicago, Ind.

Texas-New Mexico Pipe Line Co.—75 miles, 8-in., planned, Midland to Germania pool; Midland to Scarborough and Sweetie Peck area; and Crane station to McElroy area, West Texas.

Texas-New Mexico Pipe Line Co.—55 miles, 8-in., planned, Eunice to Covington and Saunders area, New Mexico.

Trans-Mountain Oil Pipeline Co. (Sponsored by Bechtel Corp.)—715 miles, under way by July 1951, Edmonton, Alta., via Yellowhead Pass to Vancouver, B. C.

West Texas Gulf Pipe Line Co.—467 miles, 26-in., authorized, Colorado City to Wortham, Tex., 26-in.; Wortham to Sour Lake, Tex., 24-in. Completion date 10-52.

West Texas Gulf Pipe Line Co.—114 miles, 20-in., authorized, Wortham to Longview, Tex. Completion date 10-52.

Products Pipe Lines

Bell Oil & Gas Co.—150 miles, 6-in., planned, Ardmore to Drumright, Okla.

Buckeye Pipe Line Co.—430 miles, 14-in., proposed, Linden, N. J., to Allentown, Pa., Junction; Chelsea, Pa., via Allentown Junction to Auburn, Rochester, Syracuse and Oswego, N. Y. Start 1952; finish 1953.

Ohio Oil Co.—24 miles, 8-in., authorized, East St. Louis to Wood River, Ill.

Phillips Petroleum Co.—163 miles, 12-in., looping from Borger, Tex., to Paola, Kans. Completion date 11-1-51.

Phillips Petroleum Co.—137 miles, 10-in., looping from Paola, Kans., to East St. Louis, Ill. Completion date 11-1-51.

Phillips Petroleum Co.—198 miles, 8-in., looping from East St. Louis, Ill., to East Chicago, Ind. Completion date 11-1-51.

Plantation Pipe Line Co.—767 miles, 14 and 18-in., under way, Baton Rouge to Charlotte, N. C., 275 miles, 14-in., under way, Bremen to Charlotte, N. C.; 432 miles, 18-in., under way, Baton Rouge to Bremen, Ga.; 220 miles, 18-in., Baton Rouge to Mississippi-Alabama state line; Williams Brothers Co. David R. Williams, Jr., project manager.

Plantation Pipe Line Co.—126 miles, 18-in., under way, Collins, Miss., to Baton Rouge, La. Williams Bros., contractor. O. R. Mitchell, spreadman, at Prestiss, Miss. Completion date 8-31-51.

Plantation Pipe Line Co.—150 miles, 18-in., under way, Moundville, Ala., to Collins Miss. Williams Bros., contractor. A. T. Maxwell, spreadman, Meridian, Miss., Completion date 8-31-51.

Plantation Pipe Line Co.—200 miles, 14-in., under way, Winder, Ga., to Charlotte N. C. Williams Bros., contractor. T. E Davis, spreadman at Athens, Go. Completion date 10-1-51.

Progress Pacific Pipe Line Co.—900 miles, 10-in., proposed, California to West Texas.

Salt Lake Pipe Line Co.—Proposed, Pasco Wash., to Puget Sound.

Sinclair Pipe Line Co.—8-in., proposed, Sinclair, Wyo., to Salt Lake City, Utah; 10-in., Houston to Baton Rouge; 16-in., Kalamazoo to Detroit; 20-in. Marcus Hook to Bayonne, N. J.; East Chicago to South Bend, Ind.

Standard Oil Co. (Ind.).—144 miles, 8-in under way by early fall, Neodesha, Kans. to Sugar Creek, Mo.

Standard Oil Co. (Ohio).—17 miles, 6-in., authorized, Toledo to West Toledo, Ohio.

Triangle Pipe Line Co.—100 miles, 10-in under way, Eldorado, Ark., to point on Mississippi River, Anderson Bros. Corp.

Tuscarora Oil Co., Ltd.—61 miles, 10-in., authorized, Knappenberger to Midland, Pa.

Tuscarora Oil Co., Ltd.—25 miles, 10-in., under way, Indiana, Pa.

Natural-Gas Pipe Lines

Algonquin Gas Transmission Co.—276 miles, proposed, Greenwich, Conn., to Boston area; 492 miles, proposed, laterals-New England area.

Amere Gas Utilities Co.—11 miles, 8-in. authorized KA-5 loop, Priceton and Athens W. Va. Completion date December 1951.

Amere Gas Utilities Co.—16 miles, 8⅝-in., proposed, loops from Mercer County to Princeton, W. Va.

Amere Gas Utilities Co.—15 miles, 8⅝-in., proposed, near Dameron to Flat Top, W. Va.

Associated Natural Gas Co.—88 miles, planned, Missouri.

Carolina Natural Gas Corp.—185 miles,

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Central Kentucky Natural Gas Co.—13 miles, 20-in., line E loop, Means to Foster, Ky. Completion date October 1951.

Central Kentucky Natural Gas Co.—15 miles, 20-in., Cold Spring, Ky., to Anderson's Ferry, Ohio. Completion date December 1951.

Cities of Booneville and Baldwin, Miss.—26 miles, ¾ and 6-in., under way, Booneville and Baldwin, Miss.; M. L. Hulcher Co., Inc., contractor, Sam Carnahan, spreadman. Completion date November 1, 1951.

Cities Service Gas Co.—179 miles, 4-30-in., gathering system in vicinity of Ulysses, Kans. Vaughn & Taylor Const. Co., Inc. D. D. Vaughn, spreadman, Ulysses.

Cities Service Gas Co.—66 miles, 6-7-8-10-in., under way, takeup Hutchinson to Wichita, Kans.; Knupp Const. Co.; Newton, Kans., field office, Cliff Harris, spreadman.

City of Alabama.—120 miles, 2 to 8-in., under way, Alabama; Modern Welding Co., Inc., contractor, D. D. Foreman, spreadman. Completion date 9-51.

Coast Counties Gas & Electric Co.—40 miles, 3, 4, and 8-in., planned, Coast and Valley region, California.

Colorado Interstate Gas Co.—215 miles 30-in., planned, Texas Panhandle to Colorado.

Commonwealth Natural Gas Corp.—53 miles, 20-in., proposed, West Bend, Ky., to Norfolk, Va.

Dow Chemical Co.—70 miles, various sizes, Midland, Saginaw, and Bay City, Mich.; Mahoney Contracting Co., contractor, Ralph Bucher, spreadman at Midland.

East Ohio Gas Co.—65 miles, 26-in., under way, near Petersburg to Cleveland, Ohio. Williams Bros., contractor. Completion date 12-1-51.

East Tennessee Natural Gas Co.—172 miles, 22-in., proposed, Greenbrier to Oak Ridge, Tenn.

East Tennessee Natural Gas Co.—100 miles, 16-in. proposed, Knoxville to Kingsport, Tenn.

Egyptian Natural Gas Co.—80 miles, 6-8-in., authorized, Norris City to Salem-Centralia, Ill., area.

El Paso Natural Gas Co.—122.9 miles, 30-in., proposed, looping along main line in Texas, New Mexico, Arizona.

El Paso Natural Gas Co.—470 miles, 24-in., under way, San Juan basin, New Mexico, to Franconia, Ariz. Completion date 10-1-51.

Grand Valley Pipe Line Co.—105 miles, 8-10-in., planned, Piceance Creek field to Rifle on to Grand Junction, Colo.

Gulf Michigan Transmission Corp.—680 miles, 30-in., proposed, Perryville, La., across Arkansas, Missouri, and Illinois to terminus near St. John, Ind.

Hope Natural Gas Co.—32 miles, 8⅝-in., under way, Terra Alta field to Fairmont, W. Va. Pipe Line Const. & Drilling Co.

Hugoton Production Co.—40 miles, 20 to 4-in., under way, near Ulysses, Kans., gathering system. Reese Bros. Const. Co., contractor, Hugoton, Kans., field office, Paul G. Reese, spreadman.

Iowa-Illinois Gas & Electric Co.—41 miles, 10-in., proposed, Washington County to Cedar Rapids, Iowa.

Illinois Gas Co.—15 miles, 4-in., under way, Lawrenceville, Ill. L. R. Young Const. Co., contractor. Completion date 8-1-51.

Kansas-Nebraska Natural Gas Co.—65 miles, 2-8-in., planned, Big Springs field to Ogallala, Neb., and to Ovid, Colo.

Kansas-Nebraska Natural Gas Co., Inc.—39 miles, 4 and 6-in., planned, Neligh to O'Neill, Neb., 54 miles, 4 and 6-in. planned, Neligh to Hartington, Neb. (extension). Completion date 1952.

Kansas Power & Light Co.—10 miles, 8-in., authorized, parallel 6-in., north from Larned, Kans.

Kansas Power & Light Co.—27 miles, 20-in., authorized, Pratt, Kans., to Calista compressor station.

Kansas Power & Light Co.—9 miles, 16-in., authorized, parallel 16-in., northeast of McPherson, Kans.

Manufacturers Light & Heat Co.—78 miles, 16-in., contracted, Berwindale, Pa., to near Saltsburg, Pa. Britton Construction Co., contractors.

Manufacturers Light & Heat Co.—35 miles, 16-in., under way, Berwindale to Clearfield County, Pennsylvania. Britton Construction Co., contractor, L. A. Stewart, spreadman at Philipsburg, Pa. Completion date 8-1-51.

Manufacturers Light & Heat Co.—31 miles, 16-in., under way, East Bank of Moshannon Creek to Trans-Penn Transit line near Hyner, Pa., Britton Construction Co., contractors, Fred McKenzie, spreadman at Renovo, Pa. Completion date 8-1-51.

Michigan Consolidated Gas Co.—31 miles, 24-in., under way, Austin Storage fields to Lincoln Storage field, Michigan. Anderson Bros. Corp., contractor. Completion date 8-15-51.

Michigan Consolidated Gas Co.—131 miles, 24-in., under way, Austin Storage fields to Detroit. Anderson Bros. Corp., contractor. Completion date 11-1-51.

Montana Power Co.—18 miles, 16-in., proposed, Pakowki Lake area to Canada-Montana border.

Montana Power Co.—52 miles, 16-in., proposed, Canada-Montana border to Cut Bank, Mont.

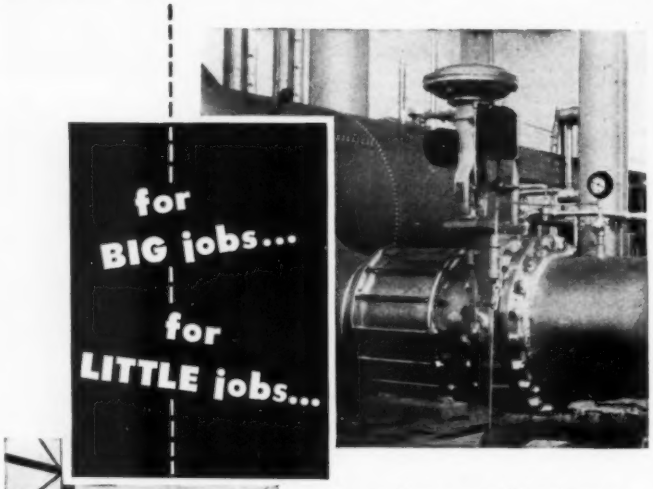
Michigan Consolidated Gas Co.—180 miles, 24-in., planned, Austin, Mich., to Detroit.

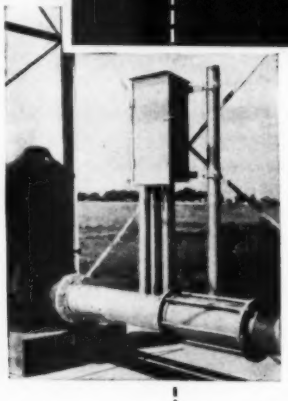
Mississippi River Fuel Corp.—98 miles, 16 and 18-in., authorized, feeder line from Lincoln Parish, La., to Waskom field, Harrison County, Texas.

Mississippi River Fuel Corp.—40 miles, 18-in. authorized, Dubach to Perryville, La.

Missouri Central Gas Co.—30 miles, 6-in., under way, Moberly to Macon, Mo. L. R. Young Const. Co., contractor. Completion date 8-1-51.

National Utilities Co. of Michigan.—76.7 miles, 20-in., proposed, South Central Michigan (22 miles from near Marshall south to Coldwater; 20 miles east to Hillsdale; 22 miles southwest to Sturgis; 5 miles





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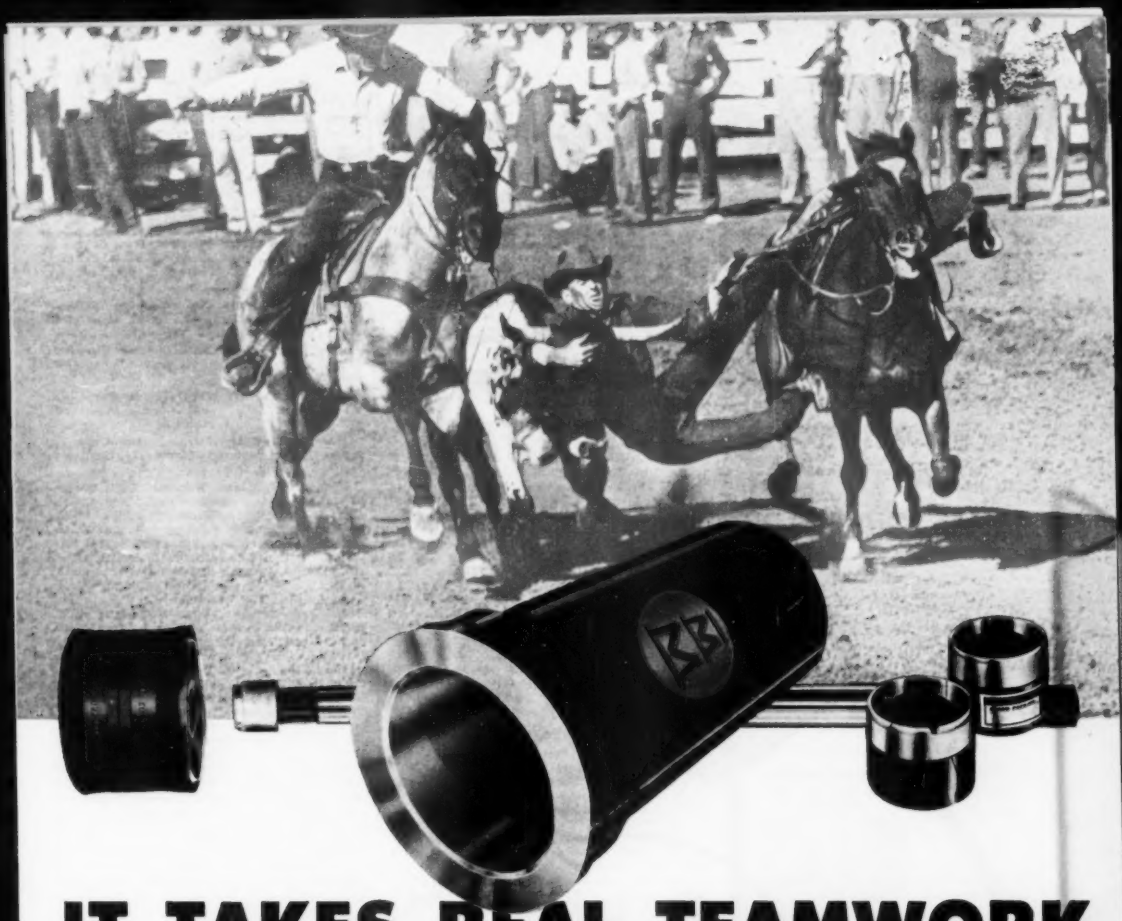

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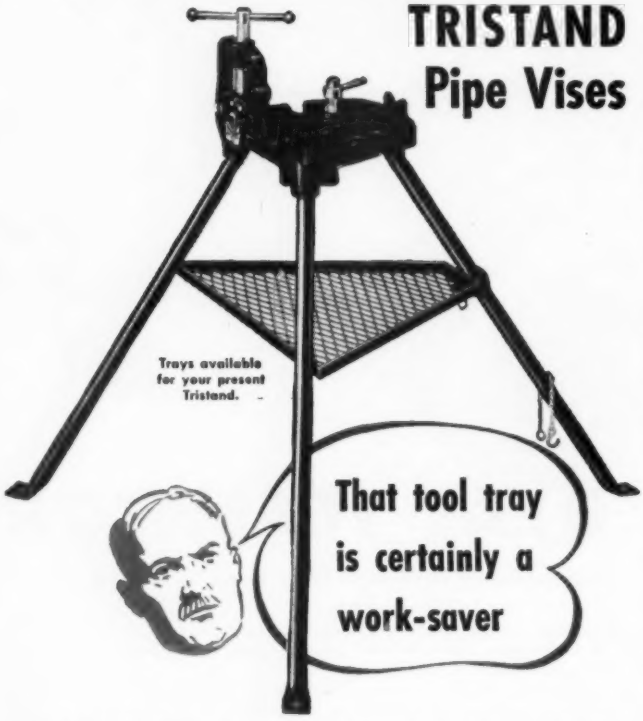
WITH RIGID TRISTAND Pipe Vises



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from Hillsdale to Jonesville and 6 miles west to Union City.)

Nevada Natural Gas Pipe Line Co.—114 miles, proposed, Topock, Ariz., to Las Vegas, Nev.

New River Gas Co.—50 miles, planned, Summers or Monroe counties, W. Va., to Narrows and Dublin, W. Va.

New York State Natural Gas Corp.—39 miles, 20-in., authorized, Potter County, Pennsylvania, to Livingston and Monroe counties, New York.

New York State Natural Gas Corp.—26 miles, 20-in., authorized, New Kensington to South Bend, Pa.

New York State Natural Gas Corp.—51 miles, 20-in., authorized, New Kensington, Pa., to Ohio line.

New York State Natural Gas Corp.—27 miles, 16-in. authorized, looping in Greene and Westmoreland counties.

New York State Natural Gas Corp.—70 miles, 20-in., planned, North Oakford, Pa., to Ohio state line.

New York State Natural Gas Corp.—62 miles, 20-in., under way, Murrysville, Pa., to Petersburg, Ohio; 37 miles, 20-in., under way, Boome storage field to Ithaca, N. Y. Field office, Lawrenceville, Pa. Completion date October 1951; 23 miles, 20-in., contracted, state line station to Angelica, N. Y. Office, Wellsville, N. Y. Completion date October 1951; 82½ miles, 20-in., under way, Utica to Ithaca, N. Y. Field office, Clinton, N. Y., Leman Creech, supt.; completion date 11-15-51; 95 miles, 16-in., under way by September, Utica to Albany, N. Y.; Williams-Austin Co., contractor, Ed Peters, over-all general supt.

New York State Natural Gas Co.—77 miles, 20-in., under way, Indiana Pa., to Petersburg, Ohio. Williams Bros., contractor. Clyde Gregory, spreadman at Leechburg, Pa. Completion date 10-31-51.

New York State Natural Gas Co.—65 miles, 26-in., authorized, Ohio-Pennsylvania state line northwesterly to Summit County, Ohio.

Niagara Mohawk Power Corp.—40 miles, 10-12-16-in., under way, lateral lines at Utica, N. Y.; 55 miles, 10-in., Fulton to Watertown, N. Y.; Williams-Austin Co., contractor, Howard Bauer, supt.

Northeastern Gas Transmission Co.—511 miles 20-24-in., authorized, New Hampshire, Massachusetts, and Connecticut.

Northeastern Gas Co.—411 miles, proposed, New England towns.

Northern Natural Gas Co.—580 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska loops.

Northern Natural Gas Co.—370 miles, 4-26-in., authorized, gathering lines in Hugoton field.

Northern Natural Gas Co.—217 miles, 26-in., under way, Palmyra, Neb., to Skellyville, Tex. G. G. Griffis Const. Co., contractor; field office, Beatrice, Neb.; G. L. Mims, superintendent; E. G. Grisham, spreadman.

Northern Natural Gas Co.—210 miles, 26-in., proposed, five loops in Texas-Oklahoma area, two in Kansas, and two in Nebraska.

Northern Natural Gas Co.—181 miles, 4-12-in., contracted, gathering system in Hugoton area. Reese Bros. Const., contractor.

Northern Indiana Fuel & Light Co.—33 miles, 8-in., proposed, Edgerton to Auburn, Ind.

Northwest Natural Gas Co.—750 miles, planned, Washington, Oregon, and Idaho.

Ohio Fuel Gas Co.—22 miles, 16-in. authorized, Dayton, Troy, Piqua, and Sidney, Ohio.

Ohio Fuel Gas Co.—74 miles, 3 to 20-in., authorized, Hocking, Knox, and Ashland counties, Ohio.

Ohio Fuel Gas Co.—47 miles, 20-in., authorized, Benton Township, Hocking County, to Columbus, Ohio.

Ohio Fuel Gas Co.—61 miles, proposed, northern and southwestern Ohio.

Oklahoma Natural Gas Co.—40 miles, 16-in., under way, Ninnekah, Okla., to County Line, Okla.; Trojan Construction Co., contractor.

Oklahoma Natural Gas Co.—26 miles, 12-in., authorized, Ringwood to Enid, Okla. Completion date January 1952.

Oklahoma Natural Gas Co.—40 miles, 2-

36-in., authorized, Ringwood field gathering system. Completion date January 1952.

Pacific Gas & Electric Co.—44 miles, 8-in., under way, Salinas to King City, Calif.

Pacific Gas and Electric Co.—141 miles, **34-in., proposed**, parallel sections along Topock-Milpitas line.

Pacific Gas & Electric Co.—10 miles, 10-12-in., authorized, Monterey to Fort Ord to Castroville; 12 miles, 16-in., Napa Wye to Shellville; 6 miles, 12-in., Cotati to Santa Rosa, Calif.

Pacific Northwest Pipe Line Co. — 400 miles, 22-in., gathering lines on Texas Gulf Coast to Pacific Northwest pipe line.

Pacific Northwest Gas Pipe Line Corp.—2,175 miles, planned, Wharton County, Texas, via Oklahoma, Kansas, Fort Collins, Colo., to Portland, Ore., Tacoma and Seattle, Wash.

Panhandle Eastern Pipe Line Co. — 174 miles, 30 and 26-in., contracted, Tuscola, Ill., eastward—looping present system; R. A Conyes, contractor. 44 miles, 26-in., Edgerton, Mich.; Anderson Bros.: 22 miles, 30-in., looping in Tuscola, Ill.; 45 miles, 30-in., looping in Montezuma, Ind.; 63 miles, 30-in., looping in Zionsville, Ind.

Pennsylvania Gas Co.—52 miles, 12-in., between Warren and Erie, Pa. (Sect. 1—27 miles, under way and contracted by Harford Bros. Sect. 2—25 miles.

Peoples Natural Gas Co.—25 miles, proposed, Cambria and Blair counties, Pennsylvania.

Phillips Petroleum Co.—118 miles, 3-22-in under way, Sherman and Hansford counties, Texas gas-gathering system; Vaughn & Taylor Construction Co., Inc., Dumas Tex., J. F. Crawford, spreadman at Texhoma, Okla.

Piedmont Natural Gas Co.—28 miles, 6 in., proposed, North Carolina—laterals from Transcontinental gas system.

Prince George's Gas Corp.—20 miles, 2" in., authorized, between Chillum and Rockville, Md.

Rockland Light & Power Co.—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

Southern California Gas Co. — 35 miles, planned, Antelope Valley, California.

Southern California Gas Co., and **Southern Counties Gas Co. of California.** — 81 miles, 30-in., proposed, Whitewater to Desert Center, Calif.

Southern California Gas Co.—22 miles, 22-in., under way, Simi to Santa Clara River, Calif. Joe E. Young Pipeline Const. Co., contractor. Completion date 9-51.

Southern California Gas Co.—24 miles, 30-in., under way, Inglewood to San Ferdando Valley, California. Alex Robertson Co., contractor. Completion date 11-51.

Southern Natural Gas Co.—21 miles, 24-in., authorized, Perryville Station, La., to Boeuf River.

Southern Natural Gas Co.—14 miles, 24-in., authorized, Onward Station, Miss., to Big Sunflower River.

Southern Natural Gas Co.—14 miles, 14-in., authorized, Perryville Station, La., to Wilhite Gate.

Southern Natural Gas Co.—375 miles, 24 in., planned, Gwinville, Miss., to Atlanta Ga.

Southern Natural Gas Co.—169 miles, proposed loops, Ouachita Parish, Louisiana, to Augusta, Ga.; 20 miles in Ouachita Parish; 33 miles in Ouachita and West Carroll parishes; 7 miles, Sharkey County, Mississippi; and 108 miles, 14-in., Bass Junction to Augusta, Ga.

Southwest Gas Corp., Ltd.—26 miles, proposed, from P. G. & E. line to Victorville, Calif.

Sunray Oil Corp.—133 miles, 3-30-in., under way, system for Snyder gasoline plant, Vaughan & Taylor Construction Co., contractor. D. D. Vaughn, spreadman.

Sunray Oil Corp.—8-in., under way, Allen to Drumright, Okla. Refinery Engineering Co., contractor. Completion date 9-51.

Tennessee Gas Transmission Co. — 992 miles, 30-in., planned, first 150 miles of loops to be laid at Monroe, La., Greenville, Miss., Midland and Portland, Tenn.

Tennessee Gas Transmission Co.—438 miles, planned, looping on Buffalo and New England extensions.

Tennessee Gas Transmission Co. and Northeastern Gas Transmission Co.—175 miles, 24-in., under way, Albany, N. Y., near Wilmington (Boston area), Mass. Oklahoma Contracting Co., contractor, Springfield, Mass., headquarters, Paul R. Halbert, manager, H. A. Wylie, spreadman at Pittsfield, Mass., Aldress Kilgore, spreadman at Westfield, Mass. L. B. Rea, spreadman.

Tennessee Gas Transmission Co. — 304 miles, 24-in., proposed, between Mercer, Pa., and Utica, N. Y.; 528 miles, proposed, loops; 260 miles, proposed, miscellaneous lateral lines.

Tennessee Gas Transmission Co. — 150 miles, 30-in., under way, vicinity of Jones, La., on the north to near Cypress, Tex., on the south; Houston Contracting Co. Four spreads located as follows: North end work at Bastrop, Tex., W. H. Hayes and M. L. Thompson, superintendents; center section at Natchitoches, La., E. C. Norris and R. F. Thornton, superintendents; south end at Conroe, Tex., F. A. Silar, superintendent.

Tennessee Gas Transmission Co.—64 miles **26 and 30-in.**, loops, contracted, South **Texas. Oklahoma Contracting Co., contractor, field office, Falfurrias, Tex., Panama Shiflett, superintendent.**

Tennessee Gas Transmission Co.—156 miles 24-in., under way, Hamburg to Onondaga-Madison County line, N. Y.; H. C. Price; Auburn and Warsaw, N. Y., field offices G. A. Reutzel and R. K. Shivel, spreadmen.

Tennessee Gas Transmission Co.—120 miles 24-in., under way, Hamburg to Hudson River; Bechtel Constructors, Inc.; Richfield Springs, N. Y., project office, R. L. Bowman and W. N. Molander, superintendents.

Tennessee Gas Transmission Corp.—419 miles, 26-30-in., authorized, loop line along presently authorized system.

Texas Eastern Transmission Corp.—791 miles, 30-in., planned, Kosciusko, Miss., to Connellsville, Pa.

Texas Eastern Transmission Corp.—163 miles, 30-in., under way, Kosciusko, Miss., to Florence, Ala.; Williams Bros.-Davis Co.; Kosciusko, Miss., field office, G. R. Hamilton, spreadman. Completion date 10-15-51.

Texas Eastern Transmission Corp. — 100 miles, 30-in., contracted, Kentucky River to Ohio River in northeastern Kentucky. Mahoney Const. Co., contractor. Henry Mogg, spreadman. Completion date 10-15-51.

Texas Eastern Transmission Corp. — 76 miles, 30-in., under way, Tennessee River to Columbia River. Eastern Pipe Line Contractors. Cliff Simmons, spreadman at Florence, Ala. Completion date 1-15-51.

Texas Eastern Transmission Corp.—73 miles, contracted, Columbia, Tenn., to Cumberland River. H. B. Zachry Co. A. Vaughn, spreadman at Columbia, Tenn. completion date 10-15-51.

Texas Gas Transmission Corp.—35 miles 12-in., authorized, Slaughters, Ky., to Evansville, Ind.

Texas Gas Transmission Corp.—189 miles, 26-in., proposed, Acadia Parish to connection with existing facilities in Morehouse Parish.

Texas Gas Transmission Corp.—195 miles 26-in., proposed, Gulf Coast region to southwestern Louisiana.

Texas Gas Transmission Corp.—425 miles 26-in., proposed, looping from Bastrop, La to Hardinsburg, Ky.

Texas Gas Transmission Corp.—580 miles 26-in., proposed, Louisiana and Kentucky

Texas-Illinois Natural Gas Pipeline Co.—1,300 miles 30-in., under way, Corpus Christi area to Joliet, Ill.

Texas Illinois Natural Gas Pipe Line Corp 58 miles, 30-in., under way, Joliet, Ill., to Volo Meter Station. Ray L. Smith & Son Inc., contractor; field office, Aurora, Ill. R. M. Jones, spreadman.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., under way, Mississippi River to Effingham, Ill.; Midwestern Constructors, Inc., contractor of Schedule 11 John Work, superintendent; field office, Vandalia, Ill. Completion date 10-15-51.

Texas-Illinois Natural Gas Pipeline Co.—100 miles, 30-in., under way, Effingham to Sibley, Ill., Midwestern Constructors, Inc contractor of Schedule 12, Fairbury, Ill., field office, Denver Franklin, superintendent. Completion date 9-17-51.

Texas-Illinois Natural Gas Pipeline Co.—91 miles, 30-in., under way, Sibley to Joliet,

Flexible Power Drive unit at work rodding a waste water line in one of California's oil fields.

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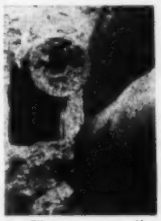
We clean all types of pipe, from 2" to 12' in diameter. We have special tools, equipment and experience to do each job fast, efficiently and economically. More than just making this our business for the past quarter of a century or more, it has been our specialty. The correct power equipment, quick cutting cleaning heads and any other facility necessary back up our specially-trained crews working under careful supervision. We can put the full-round carrying capacity back into your lines without flattening your budget.



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Ill.; Midwestern Constructors, Inc., contractor of Schedule 13. Fairbury, Ill., field office, Denver Franklin, superintendent. Completion date 9-4-51.

Texas-Illinois Gas Pipe Line Corp.—40[illegible] miles, 30-in., contracted, Arkansas and Missouri; Bechtel Corp. V. L. Williams, supt. at Little Rock, Ark.

Texas Illinois Natural Gas Pipe Line Co.—98 miles, 30-in., under way, Urbana to Garrison, Tex. H. C. Price, contractor. Completion date 8-29-51.

Texas Illinois Natural Gas Pipe Line Co.—96 miles, 30-in., under way, Garrison, Tex., to Texas-Arkansas state line. H. C. Price, contractor. Completion date 9-18-51.

Texas Illinois Natural Gas Pipe Line Co. 106 miles, 30-in., under way, Texas-Arkansas state line to Malvern, Ark. Bechtel Corp., contractor. Completion date 10-15-51.

Texas Illinois Natural Gas Pipe Line Co.—130 miles, 30-in., under way, Malvern to Newport, Ark. Bechtel Corp. Completion date 10-15-51.

Texas Illinois Natural Gas Pipe Line Co.—74 miles, 30-in., under way, Newport to Moark, Ark. Bechtel Corp., contractor. Completion date 10-15-51.

Texas-Illinois Gas Pipe Line Corp.—20[illegible] miles, 30-in., under way; Trinity River to Texarkana; H. C. Price, contractor. C. E. Shivel, spreadman at Carthage; C. R. Ice, spreadman at Nacogdoches.

Transcontinental Gas Pipe Line Corp.—35 miles, 24-in., authorized, Paterson lateral to Greenwich, Conn.

Trunkline Gas Co.—1,775 miles, 10-26-in., under way, includes 740-mile, 26-in Lake Charles, La., to Tuscola Station of Panhandle Eastern Pipe Line Co., and 1,035 miles, 10-24-in., Lake Charles, La., to McAllen, Tex., completion due October 1, 1952.

Trunkline Gas Co.—50 miles, 26-in., contracted, Longville to northeast vicinity of Hineston, La.; 126 miles, 26-in., contracted Epps to Hineston, La.; 42 miles, 16-20-in., under way, Lake Arthur, Longville to point north of Iowa, La., (Section 1, lateral line); 33 miles, 20-in., under way, Lake Arthur, La., to Lacassine, La.; Houston Contracting Co., contractor.

Trunkline Gas Co.—176 miles, 26-in., under way, Darnell, La., to Longville, La.; Houston Contracting Co., contractor of Section A, main line. E. C. Norris, Olla, La., spreadman. W. H. Hayes, spreadman, De Ridder, La.

Trunkline Gas Co.—180 miles, 26-in., contracted, Darnell, La., to Senatobia, Miss.; Anderson Bros. Corp., contractor, Section B, main line.

Trunkline Gas Co.—184 miles, 26-in., under way, Senatobia, Miss., to Paducah, Ky.; R. H. Fulton & Co., contractor of Section C, main line. Clark Williams, Memphis, Tenn., spreadman.

Trunkline Gas Co.—262 miles, 20-in., contracted, McAllen to Altair, Tex.; R. H. Fulton & Co., contractor of Section E and F, lateral lines.

Trunkline Gas Co.—317 miles, 24-in., contracted, Longville, La., to Altair, Tex.; Anderson Bros. Corp., contractor of Sections G and H, lateral line.

Trunkline Gas Co.—184 miles, 26-in., under way, Senatobia, Miss., to Joppa, Ill. R. H. Fulton & Co., contractor, Clark Williams spreadman, Union City, Tenn.

Union Gas & Electric Co.—35 miles, 8-in., Bloomington to Harris, Ill. O. R. Burden, contractor. Floyd Lewis, spreadman at Bloomington, Ill., Fall completion date.

United Fuel Gas Co.—29 miles, 20-in., authorized, Lanham to Broad Run, W. Va.

United Gas Pipe Line Co.—90 miles, 8-10-12-16-in., under way, Chalmette to Venice and West Bay Field, La. Brown & Root, Inc., contractor, J. W. Kincy, spreadman at Harvey, La. Completion date 9-51.

United Gas Pipe Line Co.—50 miles, 16-in., authorized, Baldwin County, Alabama, southeasterly to Escambia County, Florida.

United Gas Pipe Line Co.—100 miles, 20-24-26-in., contracted, Near Houma to Franklin, La.; Associated Pipe Line Contractors, Inc.

United Gas Pipe Line Corp.—510 miles, 24-26-30-in., contracted, Agua Dulce, Tex., to Monroe, La.; 233 miles, 20-24-26-30-in., from Pure Oil Co.'s offshore platform Block 32 Eugene Island area to Jackson, Miss., comp. sta.; 60 miles, 12-16-20-in., from Lafayette comp. sta. and Weeks Island field to Franklin, La., to connect with above mentioned 30-in.; 59 miles, 30-in., Jackson comp. sta., Miss., to Texas Eastern Trans. Corp.; 124 miles, Sterlington comp. sta. near Monroe, La., to Jackson comp. sta., Miss.; 23 miles, 8-12-16-in., South Louisiana facilities; all contracted by Gulf Southern Contractors, a joint venture including Texas Louisiana Contractors; Oklahoma Contracting Co.; J. Ray McDermott and Morrison-Knudson. Inspection by Brown & Root, Inc.

United Gas Pipe Line Co.—30-in., contracted, Gonzales, La., to Koscuisko, Miss. Texas-Louisiana Contractors. Completion date 11-51.

United Gas Pipe Line Co.—24-in., contracted, Baxterville, La., to McComb; Texas-Louisiana Contractors. Completion date 11-51.

U. S. Army Engineers.—190 miles, 6⅝-in., under way, Searsport to Limestone, Me.; Associated Pipe Line Contractors, Inc. Completion date 10-15-51.

Utah Natural Gas Co.—360 miles, 22-in., proposed, San Juan Basin area to Salt Lake Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Westcoast Transmission Co., Ltd.—1,408 miles, 30-in., planned, northern Alberta to Vancouver, B. C., and northern California.

Western Kentucky Gas Co.—2 to 4-in., under way, additions to present system; Modern Welding Co., Inc., contractor.

Western Pipe Lines.—1,200 miles, 22-in., planned Southern Alberta to Duluth, Minn.

West Texas Gas Co.—27 miles, 10-in., authorized, Lubbock to Abernathy, Tex.

Foreign Crude-Oil Pipe Lines—Planned and Under Way

Alberta Pacific Oil Pipe Line Co. (Brokaw, Dixon, McKee).—970 miles, 16-in. proposed, Edmonton south to Kingsgate.

THE PIG WITH THE POKE — CLEANS PIPE LINES

— THE VERY LATEST —

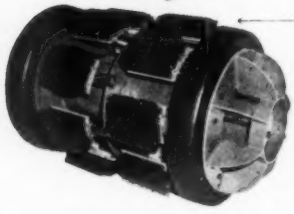
Williamson Pipe Line Pigs*

FOR CLEANING

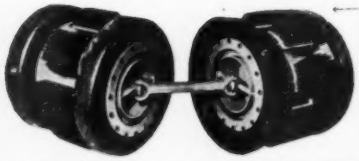
Natural Gas Pipe Lines

4" Size—TYPE JRN—2" to 4" sizes. Will pass 1½R-90° Bends. No valves other than full diameter thru-port valves. Use TYPE SCN-51 for 6" Size.

8" Size — TYPE WC-11 — 8" to 14". Will traverse 6 foot radius field bends, full diameter side opening at 45°. SPRINGS COMPENSATE for BRUSH WEAR.



20" Size—TYPE GP-2—16" to 30". 200-LB. SPRING Forces the Brushes against pipe wall —COMPENSATING for WEAR. Will traverse round-opening gate valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP PIGS.



24" Size — GP-3 — 18" to 30" Sizes will pass 1½R-90° Bends. SPRINGS COMPENSATE for BRUSH WEAR, ASSURING Full section cleaning efficiency. GP-3 consists of two Type GP-1 Pigs. — Each Unit may be used as individual pig.

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TULSA 9, OKLAHOMA

B. C., to Washington to Vancouver, B. C.

Basrah Petroleum Co.—72 miles, 12-16-in., under way, Zubair to Fao, Iraq.

Cia. de Petroleo Ganso Azul, Ltd.—4(miles, 4-in., planned, Ganso Azul field t Pucalpa on upper Ucayali River, Peru.

Condor S.P.A. (Shell).—80 miles, plannec Genoa to Rho, near Milan, Italy.

Direccion General de Yacimientos Petroli feros Fiscales.—409 miles, under way, Plaz Huincul to Bahia Blanca, Argentina.

Independent Pipe Line Co.—721 miles, 16- 18-22-in., proposed, Edmonton to Vancouver Spreads as follows: 185 miles of 22-in.; 391 miles, 20-in.; 95 miles, 16-in.; and 30 miles, 18-in.

Iraq Petroleum Co., Ltd.—556 miles, 30 32-in., under way, Kirkuk, Iraq, to Banias Syria, 1952; Bechtel-Kirkuk, contractor.

Middle East Pipelines, Ltd.—800 miles, 34- 36-in., planned, Iran to a Levantine port.

Petroleos Mexicanos.—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

Petroleos Mexicanos.—100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

Shell Caribbean Petroleum Corp.—10 miles, 20-in., under way, Across Lake Maracaibo, Venezuela, S. A. Mahoney Contracting Co.; Angelo Tavernaro, superintendent.

Shell Caribbean Petroleum Co.—165 miles, 30-in., under way; Palmarejo to terminals on the Paraguana Peninsula (Cardon and Las Piedras, Venezuela), 12-51. Land sections contracted by Williams Brothers, de Venezuela, S. A., Charles P. Williams, manager, Marvin E. Jones, superintendent. Water crossings contracted by Mahoney Contracting Co.

Shell Caribbean Petroleum Co.—16 miles, 14-in., under way, Tia Juana to Cabimas (hot oil).

Trans-Mountain Oil Pipe Line Co.—715 miles, proposed, Edmonton, Alta., to Vancouver, B. C. Canadian Bechtel, Ltd. contractor. Completion date 1952.

Winnipeg Pipe Line Co., Ltd.—75 miles, 10-in., under way, Gretna to Winnipeg, Manitoba; Sparling-Fowler Co., Ltd.

Foreign Products Pipe Lines—Planned and Under Way

Colombia Ministry of Petroleum.—90 miles, 8-in., planned, Puerto Berrio to La Dorada, Colombia.

Colombia Ministry of Petroleum.—113 miles, 6-in., contracted, Puerto Berrio to Acededo near Medellin, Colombia. Carolina Construction Co.

Colombian Ministry of Petroleum.—75 miles, 4-in., planned, Buena Ventura to Cali, Colombia.

Empresa de Ferrocarriles Ecuatorianos.—50 miles, 4-in., under way, Guayaquil to Palmira, Ecuador. J. A. Jones, contractor.

Estrada de Ferro Santos Jundiai.—32 miles, 10-in., under way, Santos to Sao Paulo, Brazil; Techint, contractor.

Estrada de Ferro Santos a Jundiai.—32 miles, 18-in., under way, Santos to Sao Paulo, Brazil (fuel oil line); Techint, contractor.

Governments of Southern Rhodesia and Portuguese East Africa.—200 miles, considered, Beria, Portuguese Mozambique to Umtali, Southern Rhodesia.

Imperial Oil Co., Ltd.—10-in., planned, Sarnia to London, Hamilton to Toronto.

Petrocongo (Sub. Cia. Financiere Belge des Petroles, S. A.).—225 miles, considered, Ango-Ango to Leopoldville, Belgian Congo.

Petroleos Mexicanos.—155 miles, 10-in., under way, Minatitlan to Salina Cruz, Mexico.

Societe des Transports Petroliers par Pipe Line.—140 miles, 10-in., under way, Le Havre to Paris, France. Entrepose, contractor. Completion date 1952.

State of Cundinamarca, Colombia.—120 miles, 6-in., Puerto Salgar, to Bogota, Colombia; Williams Brothers Corp., David Louthen, manager, Bogota.

Trans-Northern Pipe Line Co.—400 miles, proposed, Hamilton, Ont., to Toronto, Ont., to Montreal, Que., Canada.

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PIPE LINES

Booster Program

Mid-Valley awards work to increase line capacity

LONGVIEW, Tex.—Mid-Valley Pipeline Co. has given eight contractors the green light on a big booster-station construction program which will increase capacity of its 1,000-mile crude trunk line from East Texas to Lima, Ohio, by nearly 50 per cent. *(The Oil and Gas Journal, June 28, page 141, and June 21, page 353).*

The program includes the building of six new booster stations, installation of more pumping units at existing stations, and construction of a third crossing of the Mississippi River. Installing more tankage and adding additional micro-wave relay stations along the line will bring cost of the entire program to between $8,000,000 and $9,000,000.

E. F. Morrill, Mid-Valley president, said capacity of the 565-mile section of the 22-in. line from Mayersville, Miss., to Hebron, Ky., will be increased from 155,000 bbl. to 235,000 bbl. per day, with proportionate increases in sections from Longview to Mayersville and from Hebron to Lima. Completion is scheduled for early 1952, if materials come through satisfactorily.

Constructors. — New booster stations at Stevenson, La., and Minter City, Miss., will be built by Ford, Bacon & Davis Construction Co., of Monroe, La. C. E. Wilson Construction Co., of Kansas City, Mo., will build the new station at Simpsonville, Ky. Station Construction Co., of Houston, will put up stations at Hornsby, Tenn., and Elkton, Ky.; while Blaw-Knox Corp., of Tulsa, will construct the new station at Pyrmont, Ohio.

Delta Engineering Corp., of Houston, will install additional pumping units at Longview, Haynesville, Mayersville, and Abbeville, Miss. O. L. Olson, of Houston, will install the new unit at Clarkson, Ky.; Station Construction Co., at Denver, Tenn.; and Dravo Corp., of Pittsburgh, at Hebron.

Contract for construction of a third crossing of the Mississippi near Mayersville and repair work on the dual crossing there, where the company now has two 20-in. lines, has been awarded to J. Ray McDermott & Co., Inc., of Harvey, La.

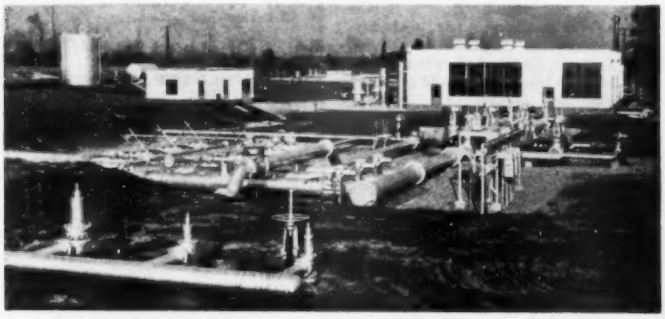
The additional construction on the company's 1,000-mile multichannel microwave relay system will enlarge a project said to be the most extensive privately owned operating system of its kind.

Hearings Continue on New Gas Pipe Lines in Southwest

WASHINGTON. — Hearings were proceeding last week before the Federal Power Commission on applications of El Paso Natural Gas Co. and Nevada Natural Gas Pipe Line Co. to pipe natural gas through the Southwest with $26,619,000 in new pipe-line facilities.

El Paso seeks an o.k. on 10 miles of pipe and compressor stations, costing $24,288,000, which would increase deliveries of gas to customers in Arizona, New Mexico, and Texas by 100,000,000 cu. ft. per day, and step up supplies to the Phoenix, Ariz., area by 83,000,000 cu. ft. per day.

Nevada Natural would build a 114-



TO GET NEW PUMP.—Shown here is the Haynesville, La., pump station of Mid-Valley Pipe Line Co., where installation of a new pumping unit will soon get under way. The unit is a small part of the company's big booster-station expansion program which will increase capacity of its 1,000-mile crude trunk line from East Texas to Lima, Ohio. Capacity of a 565-mile segment of the line from Mayersville, Miss., to Hebron, Ky., will be increased 80,000 bbl. per day to 235,000 bbl. and throughput of the remainder will be boosted proportionately.

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mile line from near Topock, Ariz., to Las Vegas, Nev., to deliver gas to Las Vegas, Boulder City, Nev., and Needles, Calif., at a cost of $2,331,000.

The Nevada firm wants to get gas from El Paso for resale to distributing companies for use by defense industries.

A. L. Hill, chief geologist for El Paso, told the commission that there are gas reserves in Lea County, N. M., and in Texas near the New Mexico border of over 4 trillion cubic feet. He said El Paso has 1.5 trillion cubic feet of this reserve under contract. He broke down the reserve total as being 2.5 trillion in Lea County, and almost 1.7 billion in counties in Texas near the border.

Gas needs in the Southwest were pictured as rising sharply by M. C. Norwood, company comptroller. He estimated the company's two main lines would be asked to carry 60 per cent more gas into the area during 1952 than in 1950.

Norwood said he expects gas orders to total 330,527,109,000 cu. ft. this year as compared with 237,348,810,000 last year.

Intervenors in the hearing included Pacific Gas & Electric Co., of San Francisco, and Southern California Gas Co. and Southern Counties Gas Co., both of Los Angeles. All three will receive gas from El Paso if the new construction is approved.

Tennessee Gas Closes Last Gap in 2,000-Mile System

HOUSTON.—Tennessee Gas Transmission Co.'s 1951 expansion program is rapidly nearing completion. The program includes the laying of 794 miles of main-line pipe and will increase system capacity to 1,200,000,000 cu. ft. per day by the end of the year.

A main-system extension stretching 303 miles from near Buffalo to the New York-Massachusetts state line has been completed. This was the last gap in the company's long system from the Rio Grande Valley 2,000 miles to New England. Laying of 491 miles of loop line is about 90 per cent complete.

General contract held by H. C. Price Co. covering construction of approximately 156 miles of 24-in. high-pressure line between Hamburg, N. Y., and the Onondaga-Madison county line, New York, was completed the first of August. Spreads for this section operated out of Auburn and Warsaw, N. Y.

Big Capacity Increase Set For Basin & Ozark System

CUSHING, Okla.—Basin & Ozark Pipeline System will soon install a centrifugal pump near Hamlin, Tex., which is said to be the largest ever built for oil-pipe-line service.

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The pump will be installed by Texas Pipe Line Co., which operates the southern half or Basin part of the system. It is the first of eight similar pumps the company will install to increase capacity of its section of the line by 100,000 bbl. per day.

Shell Pipe Line Co., operator of the northern or Ozark section of the New Mexico-to-Illinois system, will increase its capacity by 68,000 bbl. daily. Sixteen smaller pumps will be installed along the northern section.

Texas Gas Transmission Gets Go-Ahead on Louisiana Line

WASHINGTON.—Texas Gas Transmission Corp., Owensboro, Ky., has been granted temporary authorization to build a 189-mile, 26-in. natural-gas pipe line from Acadia Parish to a connection with the company's existing line in Morehouse Parish, Louisiana.

The Federal Power Commission made provision, however, that the line should be used for service only to the company's existing customers. The line, known as the company's South Louisiana supply lateral, is estimated to cost about $12,500,000.

Hearings in the consolidated proceeding have been progressing continuously since May 28 with exception of two short recesses. The commission recently denied a petition by Texas Gas Transmission and United Gas Pipe Line Co. that the intermediate decision be omitted due to the complexity and magnitude of the proceedings. Louisville Gas & Electric Co. is concerned in the hearing as well as the two firms already mentioned.

Texaco Plans 8-In. Outlet From Ventura Avenue Field

LOS ANGELES.—The Texas Co. will construct about 30 miles of 8-in. crude line between Ventura Avenue oil field, Ventura, Calif., and the company's pipe-line pump station at Fillmore, Calif.

The new line will enable Texaco to transport 15,000 bbl. of crude per day from the Ventura district to the Los Angeles Basin refinery area.

It will augment existing Ventura-Los Angeles area pipe-line capacity.

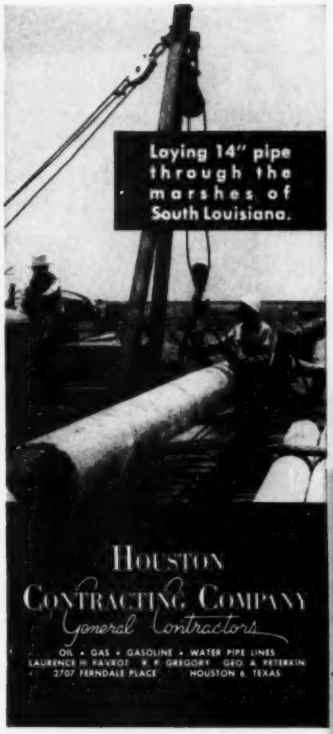
Pipe-Line Briefs

Construction of approximately 193 miles of 30-in. natural-gas line for Texas - Illinois Natural Gas Pipeline Co. from the Trinity River northeast to the Texas-Arkansas state line near Texarkana is now over 80 per cent complete. Contract for this section is held by H. C. Price Co. Spreads are located at Atlanta, Tex., under C. E. Shivel, and at Livingston, Tex., under C. R. Ice.

United Gas Pipe Line Co., Shreveport, plans to lay two 20-in. submarine lines beneath Pearl River in Mississippi. The crossings, for which the company filed application with the Army engineers for a navigation permit last week, are scheduled to cross the river 3½ miles southeast of Cheraw, Miss.

Cities Service Gas Co. has completed its 25-mile, 16-in. natural-gas line from Wichita to Hesston, Kans., and has connected Valley Center, Kans., to the line. Fabrication on the exhaust system of a new 1,200-hp. compressor unit at the company's Welch, Okla., station has been completed and the unit is being aligned. Construction work at the new Greensburg station, a 6,400-hp. facility, has been resumed after being halted by flood waters. The company's Petrolia station was shut down for complete cleaning and repair of compressor units due to the flood.

American Smelting & Refining Co., 120 Broadway, New York 5, N. Y., has developed and is offering a new slide rule designed to aid those engaged in cathodic protection. With pipe size and coil resistivity known the rule gives required magnesium size and life, length of pipe protected, and current output. It is called "Magnesium Anode Cathodic Protection Guide" and will be sent free of charge.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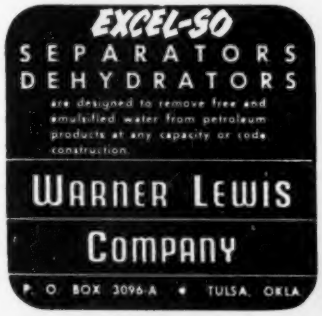
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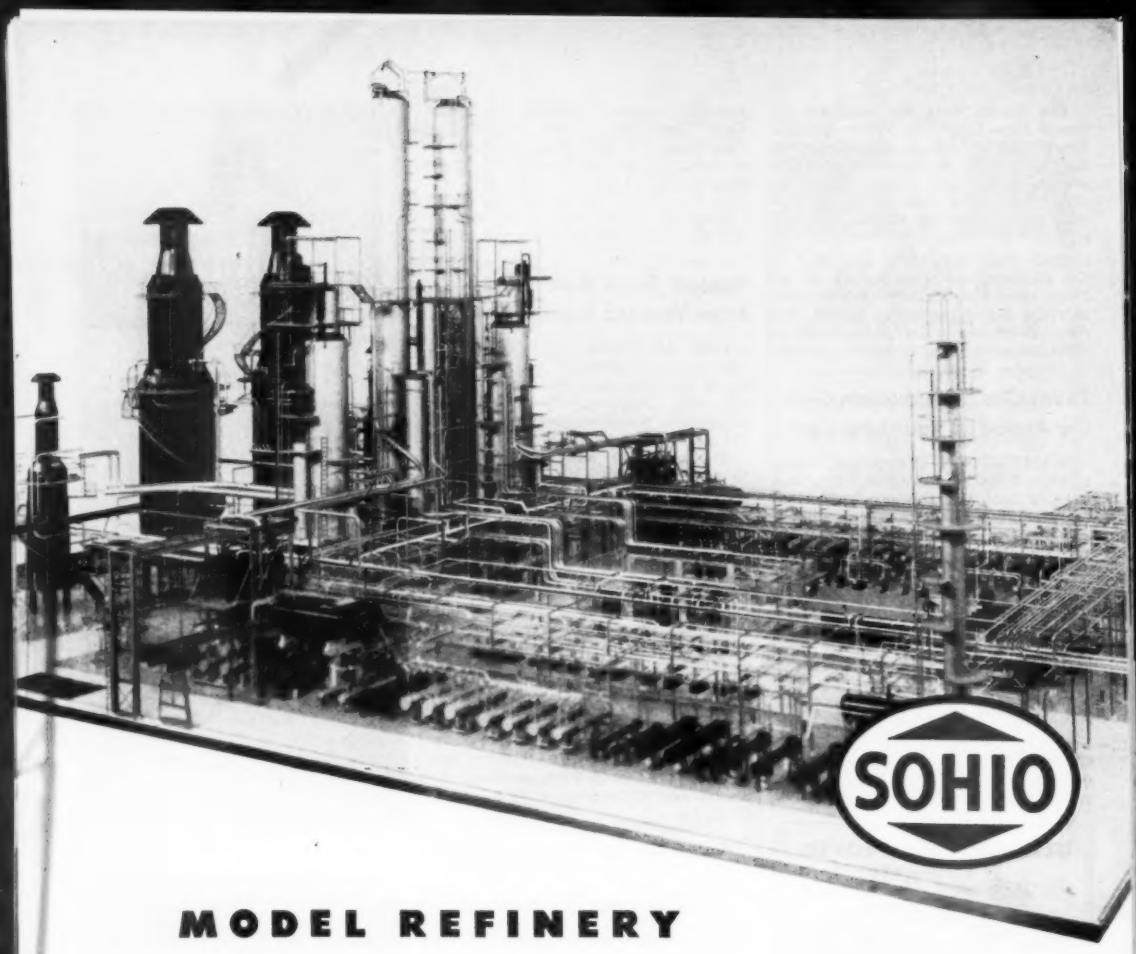

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NATURAL GAS

Western Natural, Conoco To Supply St. Charles Gas

HOUSTON. — Western Natural Gas Co. and Continental Oil Co. have agreed to supply about half of the initial gas requirements of Reynolds Metals Co.'s new aluminum-reduction plant now under construction in the Corpus Christi area.

Gas will be supplied by St. Charles Pipe Line Co., a joint venture of Western Natural and Continental, which will lay a 34-mile pipe line to the plant site from St. Charles field in Aransas County, Texas.

The contract runs for 20 years, and delivery price is 10 cents per M.c.f. for the first 5 years with maximum deliveries scheduled to begin the first quarter of 1952. Prices after the first 5 years are on a rising scale.

Western Natural will increase gas deliveries within a year to Transcontinental Gas Pipe Line Corp., Texas-Illinois Gas Pipe Line Co., The Chicago Corp., and Carthage Hydrocol, Inc.

Texas-Illinois will begin taking gas from Western Natural's reserves in Live Oak County, Texas, around April 1, 1952.

Western is continuing an active drilling program in the big Hugoton gas field in Kansas. Of 29 wells scheduled in April to be drilled by the end of this year, the company already has completed 17. Western's Hugoton production is sold to Cities Service Gas Co.

The company is looking forward to benefits from its San Juan basin holdings in northwestern New Mexico and southwestern Colorado. Western's parent firm, El Paso Natural, is now completing a big gas outlet from the area to serve the California markets.

Texas Gas Production Still Holding Fast Pace

AUSTIN. — Production of natural gas in Texas is still holding the fast pace it has maintained all this year.

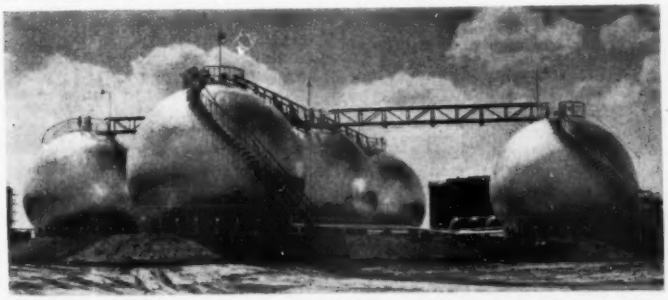
Figures for May just released by the Texas Railroad Commission show that total volume of production was 17.78 per cent more than in the same month last year, while total marketed production gained 22.75 per cent.

Transmission lines took 219.3 billion cubic feet, about 57 per cent of the total and 27.29 per cent more than in May 1950. Gas stored underground was up 100 per cent.

ULTIMATE DISPOSITION OF ALL GAS PRODUCED IN TEXAS DURING MAY
(Source: Texas Railroad Commission)

	M.c.f.	Per cent of total	Per cent increase over May 1950
Extraction loss—plants*	13,979,057	3.63	24.32
Plant fuel and lease loss	28,725,565	7.46	24.32
Gas lift	14,955,530	3.88	29.29
Pressure maintenance and repressuring	25,334,392	6.57	—5.70
Transmission lines	219,323,326	56.98	27.32
Recycled	50,639,879	13.15	5.49
To carbon-black manufacturing	27,423,625	7.12	5.04
Underground storage	19,080	.05	100.00
Vented and line loss	4,481,019	1.16	86.73
Total	384,881,473		17.87
Net total for market	308,907,208		22.75

*Extraction loss is shrinkage in gas volume due to removal of liquefiable hydrocarbons.



ECONOMICAL SETUP.—The five-spot arrangement of this battery of high-pressure L.P.G.-storage vessels makes possible the saving of a substantial amount of investment costs in overhead walkways, piping, and fire walls. The storage installation is located at the Snyder, Tex., natural-gasoline plant in Scurry County, operated by Sunray Oil Corp. for 30 companies and 60 individual coowners. The new plant shipped its first products in June.

Other gains in gas consumption were shown for plant fuel and lease use, gas-lift operations, carbon-black manufacturing, and recycling. Only pressure-maintenance and repressuring operations showed a decline.

Figures for May production and disposition of gas are shown in the accompanying table.

Peoples Seeks Exemption From PAD Gas-Curb Order

PITTSBURGH. — Peoples Natural Gas Co. has announced that it will apply for exemption from or modification of the order issued by the Petroleum Administration for Defense last week curbing the taking on of new gas customers.

Peoples, according to Christy Payne, Jr., vice president, will ask PAD for authority to administer house heating and other load limitations according to current requirements.

Payne admitted heating restrictions were necessary at times, but said that the company's own estimates indicate that they are premature at present. The company will register before August 22 with PAD its intention to file an application for exemption or modification as required in the PAD order.

If Peoples then proceeds to file the necessary application before September 15, it will continue exempt from the curb order until the petroleum administration acts on the application.

Natural Gasoline

Phillips, Humble to Build New Permian Basin Plant

BARTLESVILLE, Okla. — Phillips Petroleum Co. and Humble Oil & Refining have joined together to build a new natural-gasoline plant slightly north of Pembroke field in the Permian basin south of Midland, Tex.

The plant will serve the rapidly extending Spraberry development in portions of Midland, Upton, Glasscock, and Reagan counties as quickly as completions of wells justify.

Both companies hold considerable acreage in the area, and contracts have already been negotiated with other firms for casinghead gas from a large number of leases. Negotiations with other producers are going on now.

The companies said outpost wells already drilled indicate the plant may serve an area of more than 100,000 acres.

Phillips expects to extend its products-gathering line from its new Spraberry natural-gasoline plant about 20 miles to the north to the planned Humble-Phillips plant.

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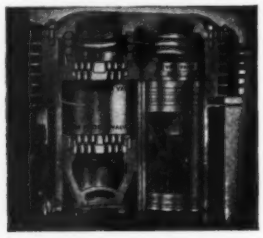

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REFINING

New Refinery

International plans 11,500-bbl. plant near Superior

MINNEAPOLIS, Minn.—International Refineries, Inc., has announced plans for construction of an 11,500-bbl. per day refinery near Duluth, Minn., and Superior, Wis., to process Alberta crude.

The $7,000,000 plant would be located in Carlton County, Minnesota, adjoining Interprovincial Pipe Line Co.'s terminal at Superior. H. M. Baskerville, International president, said construction had been approved by the Petroleum Administration for Defense and a certificate of public convenience and necessity issued by the Defense Production Administration.

Facilities would include a combination unit embodying a Model IV fluid catalytic cracking unit to be built by Lummus Co., refinery contractors. Products will be premium and regular motor gasoline, distillate, range oil, diesel fuel, and fuel oil, Baskerville said. In event of an emergency, the plant would also produce all-purpose military gasoline and jet fuel.

The plant's entire production will be sold to Western Oil & Fuel Co., of Minneapolis. Baskerville is also president of Western Oil & Fuel.

According to the company, a contract for required supplies of crude oil has been negotiated with Imperial Oil, Ltd., affiliate of Standard Oil Co. (N. J.). The crude would be transported from Alberta to the refinery by Interprovincial and its subsidiary, Lakehead Pipe Line Co., Inc.

Sun Spending $40,000,000 On 2-Year Plant Expansion

PHILADELPHIA.—The 2-year refinery modernization and construction program now well under way by Sun Oil Co. will increase the company's total refining capacity between 35,000 and 40,000 bbl. at a cost in the neighborhood of $40,000,000.

The largest single project, scheduled to get under way next spring, is Sun's new 10,000-to-15,000-bbl. refinery at Sarnia, Ont., which will cost an estimated $10,000,000. *(The Oil and Gas Journal, July 26, page 172.)*

Facilities either under construction or in the design stage at Sun's Marcus Hook, Pa., refinery include a Sun-developed Arosorb aromatics-purification unit, a Houdriformer to provide feed stock to the Arosorber, an 8,300-bbl. combination crude and vacuum-distillation unit for producing naphthenic-type lubricants, and a 6,000-bbl. propylene-polymerization plant utilizing propylene from refinery gases.

Also under construction at Marcus Hook is a large ammonia (refrigeration) unit to be operated as part of the alkylation plant to maintain a constant high-quality production of aviation alkylate.

Scheduled projects at the same refinery include a plant for producing sulfonates and naphthenic acids, extension of docks to accommodate the company's new super tankers, more storage, additions and improvements to existing lubricating oil, catalytic cracking, and TEL-blending units to increase efficiency. More shops and locker building are planned for employes.

Sun's Toledo refinery plans installation of a 10,000 bbl. per day catalytic naphtha reformer using the Platforming process. Another project at the plant is a propylene-polymerization plant similar to the type now being built at Marcus Hook. Existing plants will be added to and improved to increase charging capacity, products-pipe-line capacity will be increased, and more storage tanks will be added.

Refining Dividends Indicate 1951 Oil-Profits Record

WASHINGTON.—The oil industry apparently is on the way this year to new records in profits..

Figures compiled by the Department of Commerce show that in the first 6 months of the year the publicly reported cash-dividend payments of oil-refining corporations amounted to $394,900,000 as compared with $318,100,000 in the same period in 1950.

Dividend payments in the month of June alone amounted to $191,600,000 against $128,000,000 in the same month last year, the department announced.

The upward trend of profits in the oil industry was not out of line with the trend for all corporations. The department's survey showed that every branch of activity covered—mining, manufacturing, trade, finance, railroads, utilities, and communications—showed increases in first-half dividend payments.

Cities Service, I.O.W. Talk Over East Chicago Issues

EAST CHICAGO, Ind.—The first break in the 3-week-old strike at Cities Service Oil Co.'s refinery here

came late last week when Federal Mediation and Conciliation Service Commissioner T. J. Clelland called a meeting between the company and the International Oil Workers Union, C.I.O. Local 210.

About 550 workers walked out August 4 over an overtime work issue. The union and the company agreed on a general-wage increase of 3.8 per cent of the January 1950 base-pay rate, but negotiations bogged down over union insistance that the company give up its right to assign overtime work as needed.

L. E. Taylor, plant manager at East Chicago, said the pay hike agreed on would have been retroactive to March 7, 1951, and would have kept rates of pay in line with the general pattern of refinery wages in the area.

Explosion Rocks Esso Naphtha-Treating Plant

BATON ROUGE. — Esso Standard Oil Co.'s naphtha-treating plant at the refinery here was rocked by an explosion last week which damaged the plant an estimated $300,000, killed two persons, and injured 13.

The explosion occurred in a heavy naphtha tank which was open and ready for cleaning. Three tanks and two middle-treating units were damaged. Two of the tanks held gasoline, one was filled with tractor fuel, another with kerosine, and one with fuel oil. Cause of the blast had not been determined. Most of the burning tanks were demolished, but the fire was brought under control by company firemen.

Esso General Manager H. J. Vorhies said that other operations of the refinery would not be affected by the explosion.

PAD Surveys Lubricant, Wax-Producing Capacities

WASHINGTON. — The Petroleum Administration for Defense is now in the middle of a comprehensive survey of the petroleum industry's capacity to produce lubricating oils and waxes in relation to demands for these products, according to Interior Secretary Oscar Chapman.

The department thinks that the industries capacity to refine conventional lube oils is adequate, but wants to determine whether there is any shortage of specialized refining capacity to produce high-quality stocks needed for military aviation and automotive lubes.

Also, although there is now no over-all shortage of wax-producing capacity, the department intends to see if existing and planned production facilities are adequate to meet future defense and civilian requirements.

Military requirements for lube oils have increased sharply in volume since the Korean war began, and quality specifications for the military's ground vehicles have been raised recently, Chapman said.

Lube-oil manufacturers are being asked to submit information on capacity to produce various types of lubricants and waxes, the refining processes used, and shipments during 1950 and the first quarter of 1951, according to Bruce K. Brown, deputy administrator of the Petroleum Administration for Defense. Information is also being sought on phenols, benzene, and toluene, all of which are used in the production of lubricating oils.

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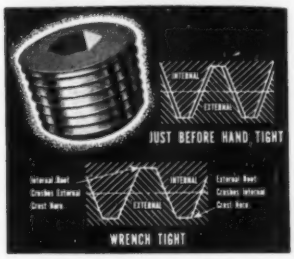

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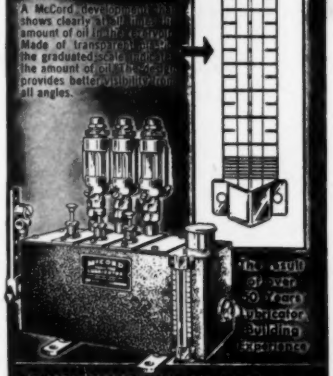

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Among the Drilling Contractors

Drilling Firm Changes Name

Powell Briscoe and Walter Clingman of Oklahoma City have changed the name of the company under which they have carried on their drilling operations from Briscoe & Clingman Drilling Co. to Shamrock Drilling Co.

New Drilling Company

C. J. Walker, J. Ewing Walker, and Daniel Strong of Oklahoma City have joined in the formation of a new drilling contracting company to be known as the Strong - McKenna Drilling Co. Headquarters will be at Oklahoma City.

New Firm at Great Bend

W. M. Barnett and Don S. Packer, formerly associated with Harbar Drilling Co., Wichita, have announced the organization of a drilling contracting company. It is the D & M Drilling Co. Operations will be carried on from Great Bend, Kans.

Justiss - Mears Drilling Co., Jena, La., is contracting for Barnett Serio and Billups Petroleum Corp. 1 Provosty, a projected Wilcox exploratory test in the C NE SW 35-6n-2e, Rapides Parish, Louisiana.

Stickle Drilling Co., Wichita, is moving in for a wildcat test to be drilled for The Texas Co. in the SE NW NE 13-35-4w, in the extreme southern part of Sumner County, Kansas. Location is ½ mile north of the Oklahoma line, and 3 miles southwest of the Fall Creek pool where the contractor has been drilling for the same operator.

Miracle-Fifer tools are being used on a wildcat test which Rock Hill Oil Co. is drilling 6 miles northeast of the one-well Dalton field, Morrill County, Nebraska. Location is for 1 Siemers, NW SE SW 2-17n-49w.

Dixilyn Drilling Co., Fort Worth, is drilling on a projected 13,500-ft. wildcat test 10 miles north of Odessa in Section 11, Block 42-1s, T&P Survey, northeastern Ector County, West Texas. V. A. Brill of Houston is the operator. Test is 1 Ratcliff and associates.

Williams Drilling Co. has taken a contract and is moving in for a 9,000-ft. test in northeastern Beaver County, Oklahoma Panhandle. The test will be drilled for Pure Oil Co. and is designated as 1 Albert. The location, in the SE SE SW 16-5n-26e CM, is 3 miles northwest of Knowles.

Allison Drilling Co., Casper, will drill another test for Shell Oil Co. on the latter's Horsetrack Unit block in southern Fremont County, Wyoming. The new test, the second, is in the SE SE NE 28-27n-97w. Rig has been moved from 1 Unit, in the NE NE NE

In the newly developed Cushing Lake field, 6 miles west of Cushing, southern Payne County, Oklahoma. Left to right: G. H. Robertson, toolpusher; and A. R. Baxter (driller), Lloyd Patrick, H. L. Aquirre, and F. T. Scroggins, drilling crew for Unit Drilling Co. of Tulsa and Bristow, Okla., contracting for T. S. and J. M. Lotland. The latter operators opened the field, located adjacent to and under Cushing Lake, water supply of the City of Cushing, early this year.

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23, where drilling was suspended at 2,628 ft.

Fleet Drilling Co., Ada, Okla., has a rig under contract to J. Horwitz for a Cromwell sand test to be drilled north of the Sylvian pool, northern Seminole County, near the Okfuskee County line, Oklahoma. Location is for 1 Joyce, NE NE SW 35-11n-7e. Projected depth is 3,650 ft.

Colorado-Wyoming Drilling Co. has the contract for a wildcat test which C. C. Thomas and Earl Crankston have projected in the East Greasewood area, Weld County, Colorado. Location is for 1 McLellan-Koke:, SW SE NW 23-6n-60w.

Viersen & Cochran, Inc., Okmulgee, Okla., has moved a rig to a wildcat location southeast of Drummond, western Garfield County, where it will drill for Mid-Continent Petroleum Corp. Location is for 1 Lowenhaupt, C SW SE 14-21n-8w.

Anschutz Drilling Co., Inc., Wichita, Kans., is making hole on its contract with Magnolia Petroleum Co. for a Dakota test at 1 Robb, in the SE SE NE 18-14n-42w, Deuel County, Nebraska.

Lyle & Sims have a rig working for Bruce Anderson and R. L. Peterson in the East Bridge area, Niobrara County, Wyoming, where they are drilling 1 Rennard, NW SE SW 21-39n-61w, a Dakota-Lakota test. Contract is for 2,450 ft.

Empire Drilling Co. is the contractor on a 6,000-ft. Dakota test which Tomberlin Petroleum Corp. and associates are starting in the West Teapot area, Natrona County, Wyoming. Location is on government-owned land in the C SW SW 2-38n-79w.

Noble Drilling Co., Tulsa, is starting another exploratory test for California Co. in the Quealy area, Albany County, northeastern Colorado. Latest operation is 1 Holst, NE NE SW 12-17n-77w. It is projected to the Dakota series, or 5,000 ft.

Delta Drilling Co., Tyler, Tex., is drilling for Mountain Fuel Supply Co. at 1 Unit, a wildcat test in the NE SE SW 35-15n-113w, Grizzly Butte area, Uinta County, southwestern Wyoming.

L. B. Jackson. Tulsa, has a contract to deepen an old hole in the Gessman area, north of Payson, Lincoln County, Oklahoma. The hole, 1 Wells, NE SW NE 10-13n-4e, is one which Harry J. Schafer of Oklahoma City has taken over. It was drilled by An-Son Petroleum Co. early in 1950. Present depth is 4,418 ft. in Bartlesville sand. It will be deepened to the Wilcox sand around 5,250 ft. Jackson has another rig working for the same operator at a location a mile to the northwest at 1 Whistler, NW SE NW 4-13n-4e.

Penrod Drilling Co., Shreveport, is starting a projected 9,500-ft. exploratory test for Southwest Gas Producing Co. in the Unionville field, Lincoln Parish, Louisiana. Location is near the center of 10-19n-2w.

E. B. Clark Drilling Co., Wichita Falls, Tex., has moved a rig to the Crows Roost Dome area, El Paso County, Colorado, where it has a contract with J. B. Stoddard for a 7,000-ft. exploratory test. Projected test is 1 State, C E½ SE NE 20-15s-62w.

W. B. Hinton, Dallas, has contracted with Louis E. Ardis for a 5,200-ft. Paluxy sand test to be drilled in the Samuel McCulloch Survey, a mile north of Posey, Hopkins County, eastern Texas.

Denver Basin Drilling Co. has contracts for two new Colorado wildcats, one in the Loveland area, Larimer County, and the other in the Mustang Creek area, Lincoln County. The former test, drilling of which already is under way, is W. E. Atkinson Producing Co. 1 B.I.Q. Unit, SE SW NE 31-5n-68w. It is projected to the Muddy sands around 5,500 ft. The latter is H. W. Hoots 1 White, SE SE SW 19-13s-56w, a 4,500-ft. Morrison test.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 8-13-51	Change week ended 8-6-51	Change week ended 8-14-50
Gulf Coast	590	— 6	+ 65
W. Tex.-N. M.	933	+10	+187
Ark.-N. La.-E. Tex.	157	— 3	+ 4
Oklahoma	306	— 4	+ 12
Kansas-S. Nebraska	187	+ 6	+ 67
Illinois-Eastern	144	— 5	+ 7
Rocky Mountains	180	— 3	+ 73
Pacific Coast	163	+ 3	+ 25
Total United States	2,660	— 2	+440
Western Canada	140	+ 6	+ 35
Total	2,800	+ 4	+475

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the West Texas-New Mexico and Oklahoma-Kansas areas are shown on pages 208 and 209.

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LEADING THE FIELD OF SEISMIC EXPLORATION

New Trends in Julesburg Basin

RECENT discoveries and currently assured strikes in the Julesburg basin indicate that the present 100-mile-long production trend from north of Gurley field to south of Lee field is going to have some competition.

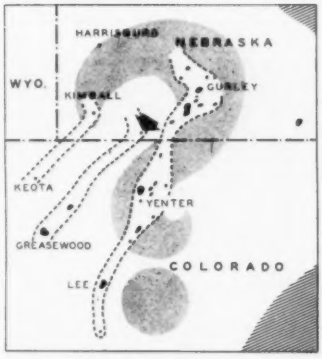
Just what form these coming trends will assume eventually is still a big question mark, but there is now definite evidence that there is to be more than one line of oil fields on the eastern flank of the Julesburg basin.

Those trends shown on the map by dashed lines are merely guesses—barnyard geology, if you prefer. There are other possibilities so if you disagree with these, draw some of your own and watch them grow or require alteration as future drilling proves you right here and wrong there. (A Gulf Oil Corp. wildcat near the junction of the Wyoming, Colorado, and Nebraska lines has indicated production since these trends were drawn. It swings the central portion of the westernmost projected trend a little to the west.)

Just 1 years ago this page carried an article which pointed out that development along the eastern rim of the Julesburg basin had established a 90-mile-long trend. *(See September 7, 1950, issue, page 123.)* At that time only five producing areas had been discovered in this portion of the basin during the period that had begun about 15 months previously with the discovery of Gurley field by Ohio Oil Co.

Today the eastern portion of the Julesburg basin has about 25 fields that are producing or have demonstrated their ability to produce oil and/or gas. All but seven of these fields are along the trend that had been established a year ago by the original five areas. Five out of seven of these producing areas are pointing out new trends; one of the others, Harrisburg, may tie into one of the trends; and the other, Big Springs (the easternmost field on the map) may be a forerunner of a shallow trend to the east.

These trends roughly parallel the southeastern limit of the basin (the Las Animas arch) throughout most of their lengths, but to the north elbow sharply and may turn to parallel the



northeastern limit of the basin (the Chadron arch). The portions of these two arches that fall within the limits of the map are indicated by shading.

Contours on top of the Dakota group show the Julesburg basin to be asymmetrical with a gently dipping east flank, an axis running close to the Rocky Mountain front, and a steeply dipping west flank. The dreamed-up trends cut across these structural contours. The eastern one climbs from —1,000 ft. at the south end to —250 ft. at the north end. The trend in the middle starts at —2,000 ft. at Greasewood and climbs to nearly —900 ft. at the arrowed well (Wytex Petroleum Corp.'s wildcat which recovered oil on drill-stem tests). The western trend, located just to the east of the Cheyenne low in southeastern Wyoming, runs from —2,000 to about —1,600 ft. between Keota and Kimball, assured discoveries.

All of these fields produce from Cretaceous sands. As in all sand areas it takes porosity and permeability to make a producible reservoir—structure alone is not the answer. In oil country throughout the world, proper sand conditions for reservoiring oil have been found to run in trends that were apparently offshore bars, shore lines, and deltas or delta-like deposits. When in comparison to the volume of potential reservoirs the volume of oil is small, as is indicated in the Julesburg basin, it takes structure to segregate the oil in commercial quantities. Structural features also run in trends.

This means that to find oil in sandstone areas with a comparatively small source of supply you have to find a combination of structure and proper sand conditions, which do not necessarily run along the same trend. This in turn means that barnyard geology, based solely on where oil has been found, should not be regarded as completely lacking of merit as those who have studied the complexities of the problems of finding oil in the Julesburg basin may be inclined to assume.

Philip C. Ingalls

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Production along the west side of Howard County was in prospect as Standard of Texas 1 Adams recovered considerable clean oil and headed oil while coming out of the hole after drill-stem testing. The limestone section at 9,620-47 ft. was not identified. Tide Water 1 Dickenson rated a daily potential of 234 bbl. of oil, through ½-in. choke from the Ellenburger.

NEW MEXICO.—Skelly, Seaboard, and J. C. Maxwell 1-J State, Lea County multiple-pay discovery west of Dollarhide, logged additional pay in the Ellenburger, then flowed at the rate of 930 bbl. of oil a day on drill-stem test.

OKLAHOMA.—Delaney Drilling Co. 1 State, located off the south side of East Sparks field in Lincoln County, flowed at an estimated rate of 50 bbl. of 47°-gravity oil from the Hunton at 4,760-82 ft.

Oklahoma

Hunton Lime Shows Oil In East Sparks Wildcat

A NEW Hunton lime reservoir, located off the south side of the East Sparks pool, in Lincoln County, appears to have been discovered by Delaney Drilling Co. at its 1 State, NW SW SW 16-13n-5e. This well, ½ mile from the nearest producer in the above pool, flowed at an estimated rate of more than 50 bbl. of 47°-gravity oil per hour for 25 minutes during a drill-stem test in the Hunton zone at 4,760-82½ ft., and in the breakdown had 1,050 ft. of oil and 180 ft. of heavily oil-cut mud in the pipe. Tester was open only 40 minutes with gas starting to flow in 1½ minutes and oil in 15 minutes. Shut in, the well built up a pressure of 1,900 psi. in 10 minutes. The East Spraks pool, opened last year, now has upwards of 85 wells, all producing from Prue sand around 3,500 ft.

Hunton lime also has given indications of new production in a wildcat located immediately north of the Maud townsite, Seminole County. The prospective discovery well is F. C. Miller 1 Wooldridge, SE NW SW 27-8n-5e. Hunton lime, having good odor and some porosity, was topped at 4,196 ft. Hole was carried to 4,216 ft. in the Sylvan, topped at 4,208 ft. A drill-stem test, taking in both zones at 4,195-4,216 ft., yielded 70 ft. of high-gravity green oil and 77 ft. of heavily oil and gas-cut mud (estimated 25 per cent oil). There was no indication of water. Shut-in bottom-hole pressure gaged 1,200 psi. Hole is being deepened to its Wilcox objective. Location is just east of the Pottawatomie county line.

Wood Oil Co. 1 Grant, SE NE SW 18-10n-5e, a wildcat located 5 miles east of Shawnee, Pottawatomie County, is showing for a possible producer in the dolomite zone, from which 150 ft. of oil with 30 ft. of mud was recovered in a drill-stem test. Total depth is 4,780 ft. with top of the pay at 4,762 ft. Production tests are now under way in open hole below 4,745 ft. Drill-stem test took in the interval below 4,764 ft. Tool was open 2 hours.

Testing also is under way at Herman Brown's new Wilcox discovery well, 1 Walker, SW NE SW 18-7n-2e, 5 miles southwest of Tribby, western Pottawatomie County, near the Cleveland county line. In early tests, the well swabbed 18 bbl. of 40°-gravity oil per hour and flowed by heads 100 bbl. per day through 2-in. tubing. Total depth is 6,138 ft. with 5½-in. casing at 6,120 ft.

Midway between the Otoe City and Northwest Otoe City pools and a possible link in connecting the two pools, D & L Oil Co. 1 Loula, NW NW NW 16-22n-1e, recovered 1,320 ft. of clean oil and 180 ft. of heavily oil-cut mud in a drill-stem test of Layton sand at 3,399-3,410 ft. Tester was open 60 minutes. Gas was at the surface in 6 minutes and oil in 40 minutes. The well flowed at intervals while pipe was being pulled. Flowing pressure during the test was 475 psi. Shut-in bottom-hole pressure was 1,375 psi. Casing has been run to 3,405 ft. for completion. Layton sand is the producing zone of both the Otoe City and Northwest Otoe City pools.

W. H. Martgan 1 Manning, NE NE NW 20-18n-6e, Payne County, flowed at an estimated rate of 100 bbl. oil oil per hour to open a new Red Fork sand pool. Total depth is 3,103 ft. Casing, run to 3,102 ft., is perforated at 3,052-64 ft. Location is a mile south of the West Markham pool, nearest production.

The Texas Co. is drilling ahead in its 1 Chapman, SW NW SE 35-4s-4e, Marshall County wildcat which has given indications of good porosity in shallow sands in the Bromide section. Good oil flows were recorded in two previously reported drill-stem tests, one at 919-27 ft. and the other at 935-52 ft. Since then additional sand, carrying saturation or stains and odors, has been cored. A 60-minute drill-stem test at 955-74 ft. flowed gas in 9 minutes and recovered 530 ft. of oil and 25 ft. of oil-cut mud. Hole is projected to 3,500 ft.

OKLAHOMA SUCCESSFUL WILDCATS

Jackson County: Sun Oil 1 Hulett-Robinson, SE SE NW 34-1s-22w, pumped 15 bbl. 41°-gravity oil from lime at 5,354-72 ft., TD 5,456 ft., Albany 1,790 ft., Cisco 2,850 ft., Canyon 3,800 ft., Strawn lime 5,262 ft.

Lincoln County: The Texas Co. 1 Roberts, SW SW NW 34-13n-3e, flowed 55 bbl. 36°-gravity oil from Skinner sand at 4,542-49 ft., TD 4,944 ft., Belle City 2,900 ft., Hogshooter 3,300 ft., Layton 3,330 ft., Checkerboard 3,690 ft., Oswego 4,330 ft., Prue 4,380 ft., Verdigris 4,460 ft., Henryetta coal 4,495 ft., Senora sand 4,543 ft., Red Fork 4,666 ft., Inola 4,741 ft., lime 4,834 ft., unconformity 4,925 ft., Mayes 4,940 ft.

Allied Materials and McLean 1 Keegan "A," SE NW SE 4-13n-5e, flowed 165 bbl. 40°-gravity oil from Prue at 3,486-3,510 ft., TD; extension to E. Sparks.

Logan County: F. G. & W. F. Catlett et al 1 Giddings, S/2 N/2 NW 21-17n-1e, flowed 296 bbl. 46°-gravity oil from second Wilcox at 5,069-82 ft., TD; Skinner sand 4,530 ft., lime 4,567 ft., Bartlesville 4,579 ft., Mississippi lime 4,679 ft., Woodford 4,716 ft., Misener 4,756 ft., Hunton 4,764 ft., Sylvan 4,839 ft., Viola 4,926 ft., first Wilcox 5,019 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Sutton 1 Luster, SW NW NW 16-1s-2w, dry, TD 1,684 ft.

Cotton County: Weaver 1 Dickman, NE NE SW 14-2s-12w, dry, TD 2,160 ft.

Garfield County: Owens 1 Hawkins, NW NW NW 17-22n-4w, dry, TD 2,513 ft.

Garvin County: Diamond - Rives - Fleet 1 Dixon, SE SE SE 9-3n-1e, dry, TD 3,485 ft.

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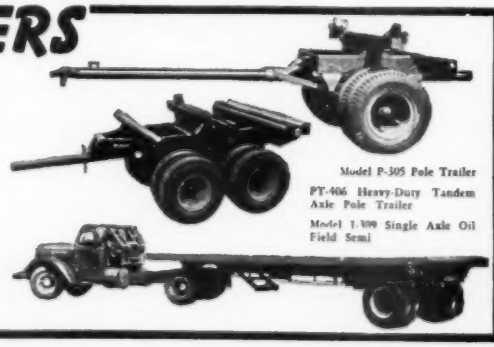

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Grant County: Continental Oil 1 Axley, SE NE SW 1-25n-3w, dry, TD 5,355 ft.
Hughes County: Halko and Balph 1 Dean, SW SE NE 16-8n-9e, dry, TD 3,551 ft.
Kay County: Sinclair Oil & Gas 1 Cromer, SE NE NW 9-25n-1e, dry, TD 4,700 ft.
Lincoln County: Wayland-Rooney 1 Adams, SW SW NW 34-15n-6e, dry, TD 4,285 ft.
Logan County: Fli-Pel Oil 1 Ward, SE SE 10-16n-2w, dry, TD 5,812 ft.
Murray County: Chapman 1 Singleterry, NE NE NW 1-1n-3e, dry, TD 542 ft.
Noble County: Howell & Howell et al 1 Morris, N/2 NW NE 18-24n-1e, dry, TD 5,073 ft.
Oklahoma County: Jordan and Warsaski 1 Kitterman, SW SW SE 30-12n-1e, dry, TD 6,575 ft.
Pawnee County: Berry Co. 1 Deming, SW NW SW 2-21n-5e, dry, TD 3,488 ft.
Pontotoc County: Yingling 1 Turner, NE NE SW 7-4n-4e, dry, TD 2,050 ft.
Pottawatomie County: Barrett, Musgrave, and Anderson 1 Truesdell "A," NE SE NW 31-8n-5e, dry, TD 4,382 ft.
Stephens County: Kirkpatrick Oil 1 Hynd, SE SE NW 5-2s-4w, dry, TD 5,770 ft.
California Co. 1 Brooks, NE NW SE 27-2s-8w, dry, TD 4,906 ft.
Woods County: Deep Rock 1 Phillips, NW NE SE 4-26n-17w, dry, TD 7,610 ft.

Rooks County: Sohio 1 Riffe, SE SE SW 4-7s-19w, pumped 119 bbl. oil from Lansing-Kansas City at 3,223-3,307 ft., TD 3,537 ft., anhydrite 1,540 ft., Topeka 2,974 ft., Heebner 3,174 ft., Arbuckle 3,512 ft.
Stafford County: Murfin 1 Batman, CSL S/2 SE 12-21s-13w, pumped 290 bbl. oil from Arbuckle at 3,523-31 ft., TD.
Sumner County: Herndon 1 Gurley, NE SW NE 6-35s-1e, pumped 87 bbl. oil from Layton sand at 3,028-73 ft., TD; Stalnaker 2,627 ft., Layton 2,991 ft.

KANSAS WILDCAT FAILURES

Barber County: National Coop. 1 Eubanks, NE NE NW 4-30s-14w, dry, TD 4,678 ft.
Barton County: Vickers 1 Benjamin, SW SW SW 31-20s-14w, dry, TD 3,655 ft.
Coppinger 1 Demel, CWL NW SE 30-17s-12w, dry, TD 3,428 ft.
Brown County: Woods 1 Turner, SW NW SW 7-1s-15e, dry, TD 3,874 ft.

Decatur County: Gore 1 Frickey, NW NW SW 31-3s-27w, dry, TD 4,355 ft.
Ellis County: Zoller 1 Simpson, SW SW NW 3-11s-17w, dry, TD 3,564 ft.
Herndon 1 Hamburg, SE SE SE 5-12s-20w, dry, TD 4,086 ft.
Hodgeman County: Kingwood 1 Folkerts, SE SE SE 21-21s-23w, dry, TD 4,564 ft.
B&R 1 Doll, NE NE NE 21-24s-24w, dry, TD 4,915 ft.
Kingman County: Smitherman & Cohen 1 Young, NW NW NW 3-28s-5w, dry, TD 3,830 ft.
Dodge 1 Gosch, SW SW NE 15-29s-5w, dry, TD 4,450 ft.
Marion County: Ingling et al 1 Potter, SW SW SE 3-22s-3e, dry, TD 2,990 ft.
Nemaha County: Woods 1 Griffiths, SE NE NE 23-5s-13e, dry, TD 3,979 ft.
Pawnee County: Schermerhorn 1 Wiles, SW SE SE 12-23s-15w, dry, TD 4,058 ft.
Pottawatomie County: Coronado 1 Welter, SW SW SW 36-8s-8e, dry, TD 2,119 ft.

Kansas

Barton County Wildcat Shows for Oil Producer

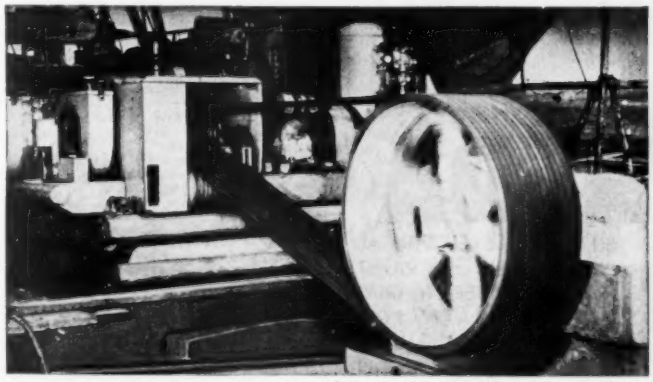
ALPINE OIL & ROYALTY Co. appears to have uncovered another new pool in the south central part of Barton County where its 1 McIlraht, NE NE NW 19-19-12, found good saturation in the Lansing-Kansas City section, topped at 3,142 ft. (—1,311 ft.), and oil showings in the Arbuckle, topped at 3,406 ft. (—1,575 ft.). A 45-minute drill-stem test at 3,146-3,211 ft. in the Lansing-Kansas City had gas at the surface in 14 minutes and recovered 2,190 ft. of oil. Total depth is 3,410 ft. with casing cemented at 3,408 ft., 2 ft. in the Arbuckle. Location is about 4 miles east and a little north of Great Bend. It is 1½ miles north of the Fort Zarah pool, nearest production.

Phillips County, on the northwestern extremity of the Central Kansas Uplift, has another prospective oil pool. The indicated discovery well is Cooperative Refinery Association 1-A Beckman, SW SW SE 3-4-19, 7 miles southwest of Phillipsburg and 3½ miles southwest of the South Stuttgart pool. It had promising oil showings in Lansing lime, topped at 3,166 ft. (—1,161 ft.). A 60-minute drill-stem test at 3,186-3,210 ft. yielded 45 ft. of oil-cut mud. A 30-minute test at 3,225-61 ft. got 25 ft. of oil-cut mud.

Atlantic Refining Co. 1 Sankey, NW NW NW 22-22-10, northwestern Reno County wildcat, established a pumping potential of 500 bbl. per day. It opens a new pool 4 miles northwest of nearest production in the Zenith-Peace Creek pool. Production is from the Lansing-Kansas City lime, opposite which casing is perforated at 3,187-95 ft. Hole is plugged back from the Arbuckle lime, which failed to show for commercial production. Swab tests in the Lansing-Kansas City pay yielded 16 bbl. of fluid, 2% per cent water, per hour.

KANSAS SUCCESSFUL WILDCATS

Barton County: Phillips 3 Hilgenberg, SW SE NW 5-16s-12w, pumped 133 bbl. oil from Toronto at 2,938-3,088 ft., TD 3,264 ft., new zone in NW Beaver.
Meade County: Skelly 1 Theis "B," SW SW NE 11-34s-26w, 21 bbl. condensate plus 4,600,000 cu. ft. of gas from Morrow at 5,736-52 ft. and 5,757-71 ft., TD 6,123 ft., Lansing-Kansas City 4,597 ft., Mississippi lime 5,785 ft.
Reno County: Cities Service 1 Birket, SW SW SW 16-24s-8w, pumped 39 bbl. oil from Lansing at 3,423-35 ft., 3,481-91 ft., and 3,501-07 ft., TD 3,785 ft.



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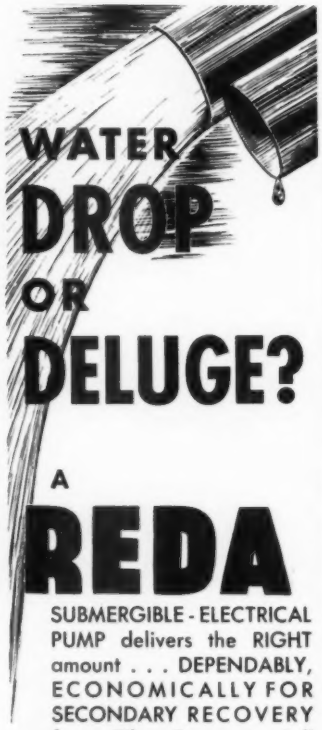

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BARTLESVILLE, OKLAHOMA

Rooks County: Deep Rock 1 Schneider, NE NE SW 9-8s-19w, dry, TD 3,475 ft.
Palmer 1 Gasaway, SW SW SE 24-10s-19w, dry, TD 3,588 ft.
Saline County: Shields 1 Swanson, SW SE NE 18-15s-3w, dry, TD 3,560 ft.
Bay 1 Royce, SE SE SE 13-15s-4w, dry, TD 3,437 ft.
Melland 1 Sundgren, NW NW SE 4-16s-4w, dry, TD 3,635 ft.
Shawnee County: Lynn 1 Warner, SW SE NW 5-13s-17e, dry, TD 2,433 ft.
Lynn 1 Blake, SE SE NW 1-13s-16e, dry, TD 2,375 ft.
Stafford County: Barbara 1 Curtis, SW SW NE 36-21s-14w, dry, TD 3,830 ft.

Permian Basin

Yoakum County Wildcat Drill-Stem Tests Devonian

MIDLAND.—Continental Oil Co. 1 Rodgers, northwest Yoakum County wildcat holding considerable interest, developed 3,000 ft. of water blanket and 200 ft. of oil and gas-cut mud on a 90-minute drill-stem test at 12,070-12,100 ft. The section had been identified as Devonian, but a top had not been picked.

General American Oil Co. 1 Richmond, scheduled 12,500-ft. wildcat, had reached 12,191 ft. in lime and shale. Top of the Mississippian, by samples, was 11,220 ft.

Hanley Co. 1 Dorton Estate, 11,500-ft. wildcat 4 miles north of Plains, was drilling below 7,157 ft.

In Martin County, Tide Water Associated Oil Co. 1 Dickerson gaged 222 bbl. of oil on a 24-hour test through ½-in. choke. Flowing tubing pressure was 60 psi. The discovery was ready for completion in the Ellenburger.

Northwest of Stanton, Sinclair Oil & Gas Co. 1 Dickenson was drilling ahead following a test at 8,194-8,289 ft. which recovered 25 ft. of mud with no shows.

In northwest Howard County, about 9 miles southwest of the Vealmoor field, Standard Oil Co. of Texas 1 Harvey L. Adams headed oil following a drill-stem test of a limestone section from 9,620-47 ft.

Gas reached the surface in 4 minutes and oil in 30 minutes. The well headed twice and died. When coming out of the hole, it unloaded oil for 1 minute after 13 stands had been pulled. Pay zone had not been identified. Location is 47-34-T&P.

Recovery on the above test was not reported, but there was a slug of water at the bottom and operators tested again at 9,637-47 ft., total depth, and recovered 10 ft. of mud with no shows. It was drilling ahead on a 10,500-ft. contract.

Northeast of Midland, Blackwood & Nichols Co. 1 Hofferkamp drill-stem tested in sand and shale identified as the upper Spraberry from 7,630-79 ft. The 3-hour test produced 2,500 ft. of fluid, mostly gas-cut mud with some oil shows on bottom. It was drilling ahead at 8,160 ft.

Between the Pegasus and Parks fields, Gulf Oil Corp. 1 Windham recovered 480 ft. of slightly oil and gas-cut mud on a 3-hour test at 10,730-93 ft. A previous test at 10,158-10,202 ft. developed 230 ft. of clean oil. Operators were coring ahead.

Second well in the Spraberry pay, Flat Rock field of Upton County, extended production 1 mile north. The well was Sunray Oil Co. 1-A University in 29-3-University Lands, which flowed 77 bbl. of oil a day from open hole at 7,245-7,416 ft.

Miami Operating Co., Inc. 1 McKissick, Gardner sand prospect in Runnels County, 8 miles northwest of Talpa, had recovered some 2,000 ft. of oil on drill-stem test at 3,765-75 ft., and at last report was flowing by heads to clean. There was no gage on the flow. Same operators staked location for 1 E. B. Taunget as a southwest offset.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Upton County: E. E. Fogelson et al 2-21 Hunt, 21-D-EL&RR Sur., 12 mi. NE

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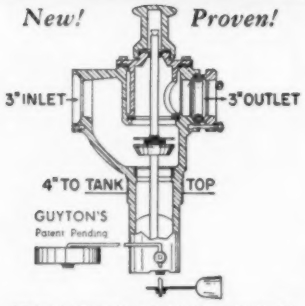

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Ranking, TD 7,200 ft., elev. 2,726 ft., Spraberry 7,125 ft., flowed 614 bbl. 38°-gravity oil, ½-in. choke, GOR 374 cu. ft., TP 100 psi.

Humble Oil & Refining Co. 1 B. P. Tippett, 20-38-T&P, TD 12,964 ft., PB 8,641 ft., elev. 2,771 ft., Spraberry 7,300 ft., pay 8,160 ft., pumped 33 bbl. 38°-gravity oil.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Andrews County: Spartan Drilling Co. 1 C. R. Thomas, 13-A48-PSL, dry, TD 9,684 ft., elev. 3,329 ft., Pennsylvanian 8,580 ft., Mississippian 8,720 ft., Devonian 9,410 ft.

Dawson County: Seaboard Oil Co. 1 Ira Robinson, 48-36-5N-T&P, dry, TD 9,980 ft., elev. 2,919 ft., Spraberry 7,457 ft., Pennsylvanian 9,912 ft.

Garza County: Seaboard and Republic Natural Gas Co. 1-A O. S. Ranch, Holmes, Divers, and Long Sur., dry, TD 3,740 ft., elev. 2,451 ft., Clear Fork 2,913 ft.

King County: American Liberty Oil Co. 1 E. V. Hardwick, 89-13-H&TC, dry, TD 5,960 ft., elev. 1,528 ft., Ellenburger 5,950 ft.

Menard County: Furney & Polk 1 W. W. Russell, Sec. 37, J. H. Gibson Sur., dry, TD 2,318 ft.

Midland County: Los Nietos Co. 1 Joe Youngblood, 40-39-4S-T&P, dry, TD 8,607 ft., elev. 2,807 ft., Spraberry 7,633 ft.

Pecos County: P. L. Crandell 1 State National Bank, 19-140-T&STL, dry, TD 1,071 ft.

Reagan County: Ashland Oil & Refining Co. 1-A University, 27-9-University Lands, dry, TD 9,536 ft., elev. 2,670 ft., Spraberry 6,220 ft.

Rowan Oil Co. et al 1 H. F. Busher, S. Bacon Sur., dry, TD 4,961 ft., elev. 1,748 ft., Canyon 3,270 ft., Morris 3,825 ft., Ellenburger 4,638 ft., Hickory sand 4,870 ft.

Sterling County: Burtler-Roche & Stalliter 1 Clark, 16-15-H&TC, dry, TD 1,864 ft., elev. 2,527 ft., San Andres 1,346 ft., Clear Fork 1,797 ft.

Tom Green County: LeMay Oil Co. 1 Frank Demere, 279-31-GC&SF, dry, TD 1,000 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Skelly Oil Co. and others' 1-J Mexico State in 32-24s-38e was developing into a major discovery for Lea County, or southwest extension of the Dollar Hide multiple-pay area across the line in Andrews County.

At last report the well had 80 ft. of Ellenburger pay indicated and testing in that formation was to continue. Top of the formation was 10,135 ft. on elevation of 3,180 ft. First test at 10,140-75 ft. developed 6,000 ft. of clean oil, some of which headed out of the pipe.

A 6-hour test from 10,175-10,200 ft. had clean oil at the top in 2 hours, then flowed 155 bbl. of 43°-gravity oil over the remainder of the test.

At last report, a test from 10,200-20 ft. recovered water blanket, 55 ft. of clean oil and 2,000 ft. of oil and gas-cut mud. Operators drilled ahead to 10,245 ft. for another test.

Gulf Oil Corp. planned to drill an east offset to the discovery in Section 13 contracted to 10,200 ft.

The Texas Co. 1-AR State, Devonian prospect in 2-11s-37e, was swabbing a small amount of gas from total depth at 11,530 ft.

Forest Oil Corp. 1 H. L. Lowe, wildcat in 25-13s-37e, was drilling in limestone at 11,242 ft. Last drill-stem test at 10,038-10,379 ft., thought to be in Wolfcamp, recovered sulfur water.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: Sharples Oil Corp. 1 Seth Alston, 17-13s-35e, dry, TD 14,410 ft., elev. 4,113 ft., Pennsylvanian 10,670 ft., Mississippian 13,580 ft., Devonian 14,350 ft.

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Michigan

Oscoda County Well Shows Oil and Gas in Richfield

MOUNT PLEASANT.—The Mio structure began to take on new significance this week as gas and oil were reported to have been recovered from the Richfield on drill-stem test at Mogul Oil Co. 1 State-Mentor, NE NE NW 32-25n-3e, Mentor Township, Oscoda County. On the basis of early information gained from the drill-stem test, core analysis, etc., this test appeared to have the best prospect of any of the wells drilled to date on the big Mio structure.

Richfield top was logged at 4,146 ft. Best oil and gas pays were reported at 4,159-61 and at 4,200-05 ft., corrected microlog measurements. Hole was bottomed out and cased with 5-in. casing at 4,237 ft. A gas blowout, gas probably coming from the second of the two best-porosity zones, forced rotary drillers to weight up mud when hole had been drilled to about 4,225 ft. It was through this heavy mud that the drill-stem test was run at the total depth with packer set at 4,138 ft. On this test with tool open for 2 hours, well showed gas in 1 minute, and at the conclusion of the test, drill-pipe carried 170 ft. of oil and gas-cut mud.

This potential reactivator of the Mio structure-area activity is located just over a mile southeast of the 1 Mio Unit discovery well (now plugged) which was completed as a Richfield discovery well by Ohio Oil Co. as unit operators in conjunction with Sohio Petroleum Co. in 1946.

Mogul's drilling block in this area includes about 600 acres. Both Ohio and Pure Oil Co. were reported to be supporting the test with either acreage, dry-hole contributions, or both. Drilling deal was arranged by Lakeland Oil Corp. and Frank Muehlenbeck and farmed to Mogul for drilling and development.

MICHIGAN WILDCAT FAILURES

Allegan County, Ganges Township: Louis Zellman 1 Jorgenson, NW NW SE 28-2n-16w, Traverse 1,244 ft., dry, TD 1,251 ft.

Ford Oil Co. 1 Madezcazk, NE NW NW 35-2n-16w, Traverse 1,192 ft., dry, TD 1,243 ft.

Otsego Township: Naph-Sol Refining Co. 1 Howe, NW NE SE 21-1n-12w, Traverse 1,382 ft., dry, TD 1,389 ft.

Arenac County, Standish Township: Frank E. Roush 1 Walker, et al, SE SW SW 23-18n-4e, Dundee 2,742 ft., dry, TD 3,006 ft.

Clare County, Garfield Township: Sam Hindman 1 Hickling, NE NE SE 29-17n-6w, Dundee 3,950 ft., dry, TD 3,967 ft.

Kalamazoo County, Prairie Ronde Township: Cook Drilling Co. 1 Hord, SW SW SW 19-4s-12w, Traverse 1,239 ft., dry, TD 1,244 ft.

California

New Zone Discovery in Townlot Drilling

LOS ANGELES. — Exploration developments included a new zone discovery in the townlot area of north Huntington Beach. Like several other discoveries, the new zone was the result of redrilling and deepening an old shallow well. Pool opener was S. C. Black 1 Black Oil, completed pumping 150 bbl. daily gross. Originally drilled to 2,801 ft. new operator sidetracked at 2,108-26 ft. and redrilled to 5,400 ft. Other than reports hole had been plugged back to 3,204 ft., details on the new zone were not available.

In nearby Orange County's San Joaquin Hills area, Shell Oil Co. has plugged back its 44-166 Irvine Ranch-One from 9,826 ft. to 1,630 ft. With 6⅝-in. casing hung at 1,615 ft. the wildcat, located in NE SW Section 11-7s-9w, at the week end was attempting to swab production through perforations at 1,002-1,615 ft.

In San Joaquin Valley activity west of Salt Creek field was attracting attention. Independent Exploration Co. extended western limits of West Salt Creek field when its 3 Anderson was completed flowing 128 bbl. in 14 hours from Phacoides sand. Top of the sand was reported at 2,205 ft., base of the oil sand at 2,265 ft., and base of the Phacoides at 2,335 ft. The company has staked location for a 3,200-ft. test, 15 Roco, about ¼ mile to the southeast, in SW SE Section 18-29s-21e.

In the Cymric area and 4 miles to the southeast in Section 26, Union Oil Co. was moving in to drill an extension test on the Anderson lease. Victory Oil Co. holds mineral rights to depths of 2,000 ft. and Union has the rights below that depth.

In Cuyama Valley the story continues to be one of unsuccessful wildcats. At its 64 Joice-B wildcat in Section 14-11n-28w, midway between Russell Ranch and Morales Canyon production, Richfield Oil Corp. suspended operations after reaching 5,592 ft.

On the southeast flank of South Cuyama production, two locations east of its recent Hibberd sand discovery in Section 5-9n-26w, Richfield also suspended operations on its 55-5 Cox after drilling to 6,451 ft. At the week end Richfield was drilling below 150 ft. on 46 Cox, a southeast offset to the discovery, 35 Cox, and a southwest offset to 55 Cox.

Near the coast in the San Gregorio Creek area of San Mateo County, 400 ft. of gas and oil-cut mud was recovered at Bell & Burden, Inc., 1 Burden after a 45-minute formation test at 3,740-3,939 ft. Gas reportedly arrived at the surface 1 minute after the tool was opened and blew fairly steadily throughout the test. Following the test the operator prepared to core ahead. Location of the wildcat is in SE SE Section 13-7s-5w.

CALIFORNIA SUCCESSFUL WILDCAT

Butte County, Princeton area, new gas field discovery: Honolulu Oil Corp. 1 Hono-

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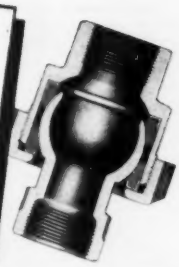

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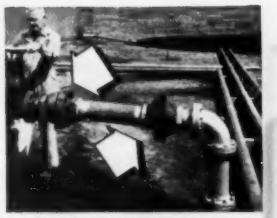

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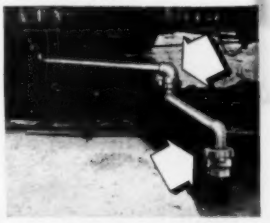

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lulu - Humble - Wild Goose, 17-17n-1e, flowed at rate of 3,500 M.c.f. daily through perforations at 3,292-3,314 ft., TD 4,009 ft., elev. 60 ft.

CALIFORNIA WILDCAT FAILURES

Fresno County, Camden area: E. C. Von Glahn 2 Coleman Community, 8-17s-20e, dry, TD 7,040 ft., elev. 230 ft.

Curry Mountain area: Signal Oil & Gas Co. 1 Signal-Honolulu-Pauson, 32-21s-15e, dry, TD 5,588 ft., elev. 910 ft.

Kern County, Dyer Creek area: J. D. Wrather, Jr. 1 Smith-Cairns, 11-26s-27e, dry, Pyramid Hills 2,205 ft., Vedder 2,268 ft., TD 2,304 ft. ,elev. 875 ft.

Kings County, Pyramid Hills area: G. H. Mitchel & Mitchel Co. 1 Mitchel-Lucier, 19-24s-18e, dry, TD 1,803 ft., elev. 660 ft.

Los Angeles County, Bartholomaus Canyon area: Bell Petroleum Co. (was W. W. Bush) 1 Bush-Bar, 6-2n-14w, dry, TD 2,988 ft., elev. 1,660 ft.

Saugus area: Humble Oil & Ref. Co. D-2 Newhall Land, 9-4n-16w, TD 1,352 ft., elev. 1,200 ft.

Orange County, Sunset Beach area: Sunview Oil Co. 1 Sunset Heights, 29-5s-11w, dry, middle Pico 1,280 ft., lower Pico 3,130 ft., Repetto 3,560 ft., TD 6,248 ft., elev. 52 ft.

San Luis Obispo County, Cuyama Valley area: Richfield Oil Corp. 2 Caliente Unit, 13-10n-25w, dry, TD 2,734 ft., elev. 2,808 ft.

Richfield Oil Corp. 64-14 Joice-B, 14-11n-28w, dry, TD 5,593 ft., elev. 2,483 ft.

Santa Barbara County, South Cuyama area: Richfield Oil Corp. 55 Cox, 5-9n-26w, dry, TD 6,451 ft., elev. 2,671 ft.

Elwood area: Fowler-Hull & Co. 1 Rutherford, 36-5n-30w, dry, TD 2,907 ft., elev. 383 ft.

Tulare County, Pixley area: Kern Oil Co., Ltd., 81 Deer-Creek, 18-23s-26e, dry, TD 4,600 ft., elev. 345 ft.

Ventura County, Calabasas area: L. C. Gould 1 Palo Camado, 14-1n-18w, dry, TD 2,526 ft., elev. 1,220 ft.

Piru Canyon area: Continental Oil Co. 1 Continental-Herley-USL, 15-5n-18w, dry, TD 3,882 ft., elev. 1,145 ft.

Tip Top Fresno area: Union Oil Co. 2 Weldon Canyon, 3-3n-23w, dry, TD 4,000 ft., elev. unreported.

You say "goodby" to damage from moisture when you put in All-Weather Motors. They're protected, *inside and out*, against condensation or a cloudburst. And they're effectively cooled by "Clean Sweep" end-to-end ventilation; shielded from mice, snakes, or airborne debris; built to keep going year-after-year with no attention at all—yet you pay not a penny premium.

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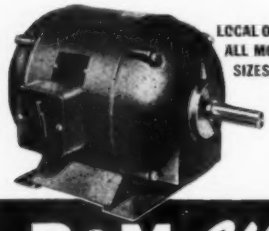

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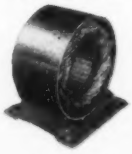

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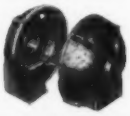

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North Central Texas

Good Strawn Sand Discovery Completing in Cooke County

WICHITA FALLS.—A good Strawn sand discovery in northeastern Cooke County was in completion process after making a flow of oil on drill-stem test.

The new well is Sinclair Oil & Gas Co. I S. F. Murrell, 3 miles west of Cosefield in the Alexander Horton Survey. Saturated sand was drilled at 3,682-3,700 ft., then drill-stem tested, with oil to the top in 15 minutes. It continued to flow after the tool had been closed, but amount of oil produced was not reported. The well made another flow of oil as drill pipe was run back into the hole.

In Stephens County, Panhandle Producing & Refining Co. 1 Copeland, southeast of Ivan, recovered 460 ft. of gas and 15 ft. of oil-cut mud, plus some free oil, on a 2-hour test at 3,811-29 ft. Section was not identified.

In Montague County, southeast of Nocona, Standard Oil Co. of Texas 1 Etter recovered 7 ft. of a possible oil sand between 5,065-74 ft. The top 4 ft. of the core was said to be oil saturated while the remainder had slight odor and stains.

Montague County received a new 6,300-ft. test as Bay Petroleum Co. and Frank Wood 1 Mary Pearl Edwards, 2 miles east of Salona. It will explore to the Caddo pay of nearby Richardson field.

In Jack County, Cox Drilling Co. 1 C. R. Schneider, wildcat 10 miles northeast of Jacksboro, produced a strong blow of gas on drill-stem test at 5,611-30 ft. Recovery was a small amount of gas-cut mud. It was drilling ahead in conglomerate at 5,655 ft.

A good gas show was reported at Mid-Continent Petroleum Corp. 1 Norton, Wise County wildcat northeast of Paradise. Drill-stem test from 5,139-47 ft. produced gas at the rate of 1,700,000 cu. ft. daily and recovered 10 ft. of gas-cut mud. It was drilled ahead.

Lion Oil Co. 1 Mrs. Maggie Oates, Fisher County wildcat, was drilling ahead after developing some gas-cut mud and sulfur water on tests in the Ellenburger at 5,705-21 and 5,705-59 ft.

Ohio Oil Co. completed its 1 City of Aspermont in 129-D-H&TC, for 367 bbl. of oil a day through $^{3}/_{8}$-in. choke, from Canyon sand perforations at 4,928-36 ft.

In Taylor County, Warren Oil Corp. 1 M. G. Reed, $^{1}/_{2}$-mile north offset to Saxon Oil Co.'s 1 Billingsley, recent discovery, completed for 122 bbl. of oil in 14 hours. Flow was through 18/64-in. choke from the Gardner sand at 4,276-78 ft.

Northwest of Throckmorton, Woodson Oil Co. 3-Q R. A. Brown, Section 202, BBB&C Survey, flowed 176 bbl. of oil in $6^{1}/_{2}$ hours through 30/64-in. choke, for a calculated daily potential of 648 bbl.

Lebus Brothers 1 H. O. Prideaux estate, $^{3}/_{4}$ mile west of nearest Strawn production in the Prideaux field northwest of Markley in Young County, completed for 65 bbl. of oil a day on the pump from pay at 2,998-3,004 ft. The section was given a Hydrafrac treatment, said to be fairly new procedure for the area.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Callahan County: Magnolia Petroleum Co. 1 Elma Jackson, Sec. 115, BBB&C Sur.,

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Monarch is built to carry saturated steam at temperatures up to 388° F. and pressures up to 200 lbs. . . . and do it day in and day out without failure. The tube is an exclusive Hewitt-Robins development—a special heat-resisting compound that stays soft and flexible without flaking or cracking.

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5 mi. N Baird, TD 4,442 ft., elev. 1,707 ft., Ellenburger 4,376 ft., pay 0,417 ft., flowed 317 bbl. 43°-gravity oil, 18/64-in. choke, TP 160 psi., GOR 342 cu. ft.

Coleman County: Luling Oil & Gas Co. 1 I. G. Whittington, Sec. 11, T&NO, 1 mi. W Glen Cove, TD 3,370 ft., elev. 1,989 ft., Fry sand 3,323 ft., flowed 423 bbl. 45°-gravity oil, 20/64-in. choke, TP 150 psi., GOR 560 cu. ft.

Eastland County: P. M. Barton 1 J. M. Stevenson, 66-4-H&TC, 5 mi. NE Cisco, TD 3,446 ft., elev. 1,578 ft., Lake sand 3,425 ft., 1,150,000 cu. ft. gas.

Curtis McBroom 1 L. A. Hightower, Van Norman Sur., 8 mi. E Eastland, TD 1,213 ft., pumped 3 bbl. oil.

Jack County: Warren Oil Corp. 2 Billie Yates, G. Ramsdale Sur., 3 mi. NE Vinyard, TD 5,695 ft., perf. 4,192-4,205 ft., flowed 30 bbl. 42°-gravity oil, 12/64-in. choke, TP 175 psi., GOR 1,938 cu. ft.

Jones County: W. E. Butler 1 G. B. Triplett, Blk. 201, J. J. Hughes Sur., 3 mi. E Truby, TD 2,500 ft., pay 2,255 ft., pumped 168 bbl. 40°-gravity oil.

Montague County: G. S. Atchison 1 John Kirby, Blk. 156, J. Smith Sur., 6 mi. S Belcherville, TD 6,178 ft., pay 5,853 ft., pumped 98 bbl. 41°-gravity oil, GOR 503 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Trancontinental Oil Corp. 1 S. R. Roddy, J. Scott Sur., A-915, dry, TD 5,500 ft., elev. 1,000 ft., Caddo 5,225 ft.

Youngblood & Foree 1 Edwards-Bloodworth, Blk. 13, George Bruner Sur., dry, TD 4,710 ft.

Brown County: T. L. Williams 1 McFarlane, Mahala Duncan Sur. 55, dry, TD 1,700 ft., elev. 1,540 ft., upper Fry 1,645 ft., lower Fry 1,688 ft.

Clay County: G. W. Cooper 1 G. D. Crockett, Blk. 71, Grayson CSL, dry, TD 4,810 ft.

Coleman County: B. H. Nolan et al 1 Brown est., 3-3-5-Bomar Sur., dry, TD 3,430 ft., Jennings sand 3,290 ft.

Cooke County: John R. Dillon 1 John Hudson, J. Worley Sur., dry, TD 2,259 ft.

John R. Dillon 1 J. J. Raiser, J. Worley Sur. 1,129, dry, TD 2,248 ft.

Erath County: B. W. Fitzgerald 1 H. R. Wilcoxson, T. Hickman Sur. 345, dry, TD 3,572 ft., elev. 1,339 ft., Ellenburger 3,536 ft.

Haskell County: E. K. and E. M. Burt 1 Swenson Bros., 13-1-BBB&C, dry, TD 2,515 ft., King 2,290 ft., Swastika 2,462 ft.

Crown Central Petroleum Corp. 1-B Cahill, 36-1-H&TC, dry, TD 5,700 ft., elev. 1,613 ft., Caddo 5,391 ft., Mississippian 5,653 ft.

Jones County: J. J. Lynn 1 G. H. Ekenstam, 19-3-H&TC, dry, TD 4,768 ft., elev. 1,529 ft., Strawn 4,175 ft., Caddo 4,735 ft.

West Central Drilling Co. 2 John Byram, 19-15-T&P, dry, TD 2,435 ft., elev. 1,732 ft., Flippen 2,295 ft.

Palo Pinto County: Lee Hicks 1 Clara S. Fuller, 38-3-T&P, dry, TD 1,824 ft.

Shackelford County: Woodson Oil Co. 1-B Paul Pitzer, Sec. 539, TE&L Sur., dry, TD 751 ft.

Stephens County: W. T. Brookover 1 T. L. Boles, Sec. 448, SP Sur., dry, TD 1,713 ft.

R. B. Fields 1 C. K. West, R. Haley Sur., dry, TD 2,404 ft., Strawn 1,700 ft.

Stonewall County: Continental Oil Co. 1 C. E. Keen, 168-D-H&TC, dry, TD 5,551 ft., elev. 1,781 ft., Dotham 2,988 ft., Canyon reef 5,350 ft.

Taylor County: West Central Drilling Co. 1 Sandusky, 8-9-SPRR, dry, TD 3,160 ft., elev. 1,913 ft., Flippen 2,731 ft., reef 3,110 ft.

Wichita County: James S. Smith 1 H. C. O'Benhaus, Blk. 329, Waggoner CSL, dry, TD 1,851 ft.

Frank Wood 1 Goetze Bros., Sec. 1 SA&MG Sur., dry, TD 2,120 ft.

Wilbarger County: Frank Wood 1-D Baker, 29-5-H&TC, dry, TD 1,966 ft.

Young County: Cabot Carbon Co. 1 R. T. Wells, Sec. 747, TE&L Sur., dry, TD 4,749 ft., Mississippian 4,649 ft.

Rocky Mountain

Julesburg Basin Gets Three More Discoveries

DENVER.—Three new discoveries in the Denver-Julesburg basin are being completed this week, following recovery of oil on tests. Two of the wells are in Kimball County, Nebraska, and one in Weld County, Colorado, with the three outside the general producing area of previous fields through the current exploratory play in the basin.

Gulf Oil Corp. found oil in the J sand (third Dakota) at the first operation by the company in the current play. The well is 1 Sisson, NW NW NW 18-12n-58w, and J sand was topped at 7,333 ft. Tool was open 43 minutes and the recovery was 2,070 ft. of gas-cut oil from the zone 7,328-61 ft. Gulf is now coring ahead in the sand.

Wytex Petroleum Co. and Derby Oil Co. recovered oil on test of the D sand at 1 Dunn, NE NE SE 3-13n-53w, also in Kimball County, Nebraska. The D sand (first Dakota) was found at 5,533 ft. and the test was between 5,542-50 ft. with the recovery 4,800 ft. of oil and 40 ft. of oil-cut mud in 2 hours and 50 minutes. A previous test at 5,533-43 ft. showed 3,360 ft. of oil with 240 ft. of oil-cut mud on a 105-minute test. The operator is coring and testing on the well, and may test the J sand prior to completion.

On the Colorado side of the line, Wycolo Development Co. of Cheyenne has reportedly swabbed 10 bbl. of oil per hour with no water from 1 Gillette, C SE 4-9n-61w, Weld County. Casing was perforated between 7,325-66 ft., probably in the J sand. The operator has not released complete information on the wildcat. This well is west of previous production in the Colorado portion of the current play, extending the limits for opportunity of production west in the basin.

Both development and exploratory drilling in this basin has increased considerably during the past few months, and the wildcat discovery rate for this year has been high.

Interest in the San Juan basin has been attracted to the Southern Union Gas Co. deepening at 2 Culpepper-Martin, NW SE SE 30-32n-12w, in LaPlata pool, San Juan County, New Mexico. This well was completed a year ago as a Mesaverde producer and has been deepened to the Dakota.

Unofficial reports indicate the well found saturation in the Dakota and the operator has failed on two drill-stem tests. The operator has released no information on the well. This is one of the few wells drilled to the Dakota in the center of the San Juan basin of New Mexico, although oil has been found in that formation in two deep tests. The outcome of the present well is expected to have considerable effect on future drilling to that formation throughout the gas fields of San Juan and Rio Arriba counties. Meanwhile, Pictured Cliffs and Mesaverde gas drilling is continuing at a rapid pace throughout the area.

Drilling is active in the Uinta basin of Utah, with The California Co. now completing two new producers in Red Wash field. Standard Oil Co. of California, the parent company, has announced that the company will spend more than $7,000,000 on exploration in the state this year, with the program including a 16-well development drilling program for Red Wash. Production in this field is from basal Green River fractured shale, at depths of around 4,500 ft., and three wells have been completed since discovery early this year.

WYOMING WILDCAT FAILURES

Sage Basin, Carbon County: Signal Oil & Gas Co. 1 State, NW SE SW 2-16n-88w; TD 1,468 ft.; dry. Chugwater 1,037 ft., Madison 1,101 ft., Cambrian 1,285 ft.

Orin Junction, Converse County: The California Co. 1 Carmin, NE SW NW 15-31n-70w; TD 4,672 ft.; dry. Lower Steele 285

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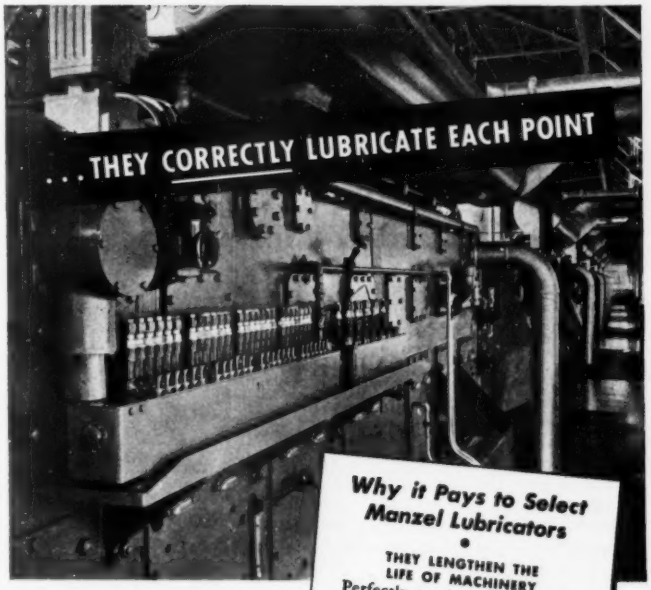

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ft., Niobrara 2,023 ft., Carlile 2,480 ft., Frontier 2,600 ft., Mowry 3,519 ft., Thermopolis 3,890 ft., Base Muddy 3,750 ft., Dakota 3,867 ft., Morrison 4,098 ft., Sundance 4,322 ft., Chugwater 4,654 ft.

Horse Track, Fremont County: Shell Oil Co. 1 Unit, NE NE NE 28-27n-97w; TD 2,628 ft.; dry. Tertiary to 1,449 ft., Gallatin 1,450 ft., Gros Ventre 1,628 ft., Flathead 2,585 ft.

South Skull Creek, Weston County: Ben F. Brack 1 Government-Hallett, NW NW NE 21-41n-62w; TD 4,777 ft.; dry. Newcastle 4,446 ft.

COLORADO WILDCAT FAILURES

Ignacio Area, La Plata County: Mac T. Anderson 1 Sitton & Gray, C NE NW 15-34n-7w; TD 2,652 ft.; dry. Fruitland 1,911 ft., Pictured Cliffs 2,205 ft., Lewis 2,591 ft.

Towaoc, Montezuma County: Cortez Petroleum Co. 2 Porter, NE NE SE 1-34n-17w; TD 6,929 ft.; dry. Dakota 912 ft., Shinarump 3,620 ft., Rico 5,587 ft., Hermosa 5,840 ft., Paradox salt (?) 6,904 ft.

Brush Area, Morgan County: Sohio Petroleum Co. 1 Lenhart, NE NW SE 7-3n-56w; TD 5,900 ft.; dry. Niobrara 4,520 ft., Ft. Hays 4,780 ft., Carlile 4,825 ft., Greenhorn 4,898 ft., "D" sand 5,236 ft., "J" sand 5,306 ft., "M" sand 5,601 ft., "O" sand 5,631 ft., "R" sand 5,730 ft. (?), "T" sand 5,847 ft. (?), Morrison 5,886 ft.

Wildcat, Washington County: Niloco 1 Ward NW NW SW 31-1s-53w; TD 5,224 ft.; dry. Niobrara 3,794 ft., Timpas 4,249 ft., Carlile 4,304 ft., Greenhorn 4,374 ft., Graneros 4,475 ft., "D" sand 4,709 ft., "J" sand 4,769 ft., Fuson 4,975 ft., Lakota 5,062 ft., Morrison 5,216 ft.

MONTANA WILDCAT FAILURES

Agawam, Teton County: Sunray Oil Corp. 1 C. K. Malone, C SW SE 33-26n-4w; TD 1,917 ft.; dry. Ellis-Madison 1,907 ft.

Ryegate Area, Wheatland County: Seaboard Oil Co. 43-22 State, NE SE NW 22-6n-18e; TD 3,913 ft.; dry. 1st Cat Creek 2,670 ft., Kootenai 2,785 ft., 3rd Cat Creek 2,970 ft., Morrison 3,065 ft., stray sand 3,270-78 ft., Ellis 3,355 ft., Amsden 3,566 ft., Kibbey (?) 3,652 ft., Charles 3,744 ft.

NORTHERN NEW MEXICO WILDCAT SUCCESS

South Largo Area, Rio Arriba County: Thomas Doswell 2 Doswell, C NW SE 9-26n-6w; TD 6,692 ft.; IP 464 bbl. oil daily. Pictured Cliffs 2,870 ft., Cliffhouse 4,580 ft., Point Lookout 5,205 ft., Tocito 6,622-40 ft.

WESTERN NEBRASKA WILDCAT FAILURES

Wildcat, Cheyenne County: C. A. (Doug) Johnson 1 Doran, SE SE SE 7-14n-46w; TD 4,529 ft.; dry. Niobrara 3,142 ft., Greenhorn 3,679 ft., Muddy 3,912 ft., Skull Creek 4,090 ft., Dakota 4,257 ft., Morrison 4,497 ft.

Julesburg Area, Deuel County: C. D. Edmonson 1 R. M. Lindsey, NW NW NW 4-12n-44w; TD 3,997 ft.; dry. Niobrara 2,638 ft., Ft. Hays 3,024 ft., Carlile 3,062 ft., Greenhorn 3,228 ft., "D" sand 3,443 ft., "J" sand 3,560 ft., Skull Creek 3,637 ft., "M" sand 3,730 ft., "O" sand 3,775 ft., Morrison 3,995 ft.

East Dalton, Morrill County: J. E. Adams-Ideal Drilling Co. 1 Frerichs, SW SW SE 7-17n-47w; TD 4,453 ft.; dry. Niobrara 3,365 ft., Ft. Hays 3,605 ft., Codell 3,766 ft., "D" sand 4,177 ft.

Lynn, Morrill County: Sohio Petroleum Co. 1 Dove, NW SW SE 1-21n-49w; TD 6,315 ft.; dry. Sundance 4,590 ft., Spearfish 4,685 ft., Day Creek 4,760 ft., Blaine 4,775 ft., Harper 4,965 ft., Stone Corral (Minnekahta) 5,180 ft., Big Blue (Opeche) 5,240 ft., Shawnee 5,610 ft., Lansing-Kansas City 5,810 ft., Marmaton 6,010 ft., Cherokee 6,135 ft. (?), granite wash 6,280 ft., granite 6,308 ft.

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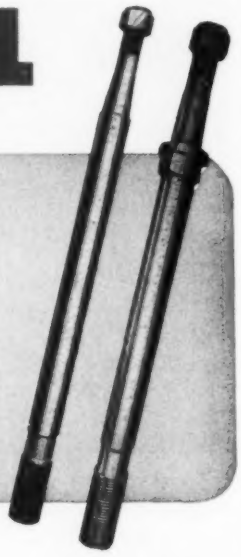

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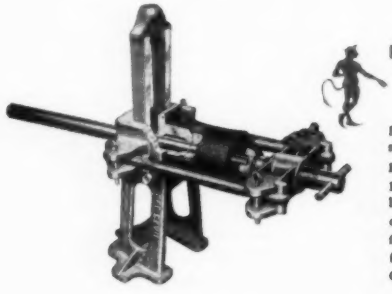

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The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

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These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.

Complete information in Composite Catalog or write for price catalogs noted above. Red Devil products are available through your supply store.

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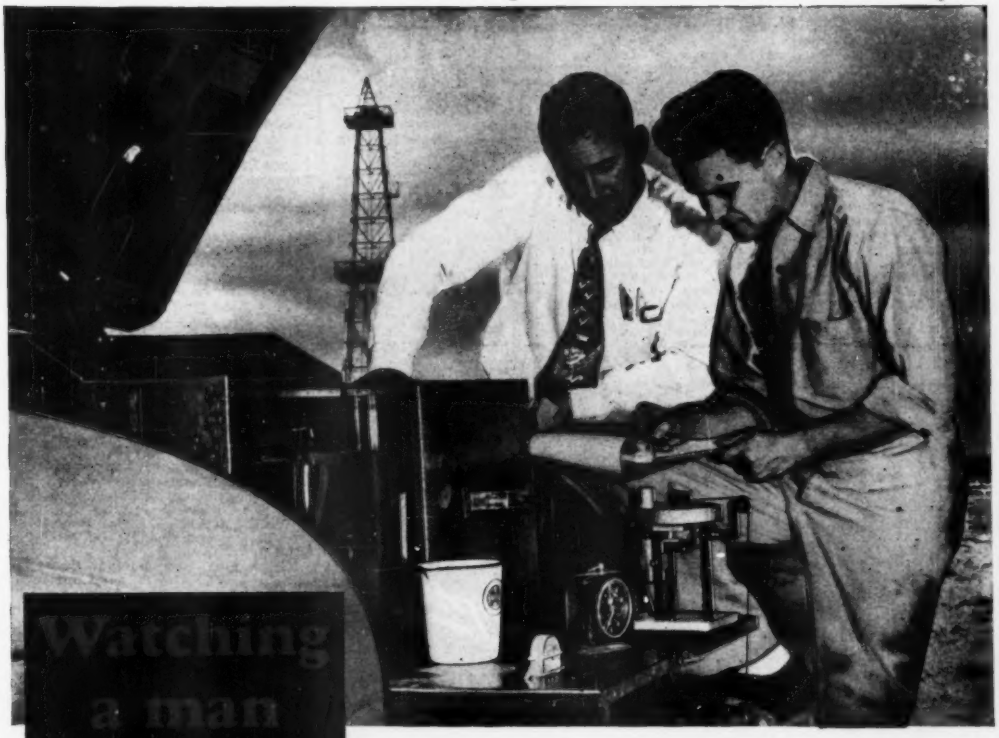
Canadian Fields

Natural Gas Strikes Pace Week's Work

CALGARY. -- Three new natural-gas strikes were made in the prairie provinces during the past week, including two in Alberta and one in Saskatchewan. Also on the central plains of Alberta, an oil discovery in the Alliance area was confirmed as a small pump producer, and the first follow-up drilling was started.

One of the new gas finds was made in the Sibbald area where two natural gas discoveries have already been recorded, one in the Viking and the other in the Lower Cretaceous horizon. The new discovery, also in the Viking sand, is located about 8 miles northeast of the initial discovery and 6 miles west of the Saskatchewan border. The well, 1 Highland Park, is a joint venture of the Sun-Royalite-Act team, on farmout lands from Albercan Oil Corp. The site is in LSD 1, 12-29-2w4, some 40 miles east of a new gas discovery in the Kindersley area of Saskatchewan. During a drill-stem test in the Viking around 2,497 ft., gas flowed at a rate of 3,700,000 cu. ft. daily through ½-in. choke. The crew is now heading for lower potential oil and gas horizons, with the current depth at 3,010 ft. The well will be a D3 Devonian (or equivalent) test.

The other Alberta gas discovery was made in the St. Paul area, nearly 100 miles northeast of Edmonton. This venture, owned jointly by Decalta Oils and Transvaal Exploration, Ltd., is 1 Decalta-Transvall-St. Paul, in LSD 4, 21-59-8w4. A drill-stem test in the Lower Cretaceous at bottom 1,392 ft., gave a gas rate of between 1,600,000 and 2,000,000 cu. ft. daily. The site is some 18



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miles southwest of Bonnyville area gas and heavy crude-oil production.

Southern Saskatchewan's second promising gas discovery was recorded this week at a wildcat drilled in the Smiley-Kindersley area, 31 miles east of the Alberta border. This well, like its Sibbald area neighbor in eastern Alberta, also struck gas in the Viking sand but in a more substantial volume. The well, Royalite-Albercan- Smiley 1, about 120 miles west-southwest of Saskatoon, is being drilled by Royalite Oil Co. on farmout lands from Albercan. A drill-stem test at 2,295 ft. gave an estimated gas flow rate from 8,000,000 to 10,000,000 cu. ft. daily. It is expected to drill another 2,000 ft. before completing, and at last report coring and testing in the Viking was being continued. Meanwhile, the 1 Socony-Vacuum-Western Prairie-Tompkins, gas discovery in southern Saskatchewan, about 110 miles south of the Smiley discovery, is now in the Devonian with current depth at 5,215 ft. This well will test all horizons for oil and gas down to around 6,500 ft.

Canadian Superior Oil Co. of California, Ltd., confirmed that it will have at least a small pumper at its oil discovery well in the Alliance area, about 130 miles northeast of Calgary. The well has been pumping periodically for the past few weeks, but as yet enough data is not available to determine the well's potential. Oil is coming from the basal Cretaceous interval at 3,144-54 ft., and has a gravity of 26°. The first follow-up venture to the discovery has been spudded in LSD 5, 31-40-12w4, ¾ mile northeast of the strike.

Oil flowed to the surface during a drill-stem test of Bay Petroleum Corp.'s 7 Woodbend, located on the first 40-acre tract in the Leduc-Woodbend area that will have three oil wells producing. It is located on the same legal subdivision as Bay 5 and 6, D3 and D2 oil wells, LSD 3, 31 50-26w4. The well drill-stem tested the Lower Cretaceous interval at 4,245-55 ft. and received an oil flow in 55 minutes. Gravity of the oil was 33°.

CANADIAN SUCCESSFUL WILDCAT

Pan Western-Baxter Lake 2, LSD 4, 4-47-6w4, TD 2,166 ft., oil well.

CANADIAN WILDCAT FAILURES

Select-Alix Lacombe 1, LSD 8, 22-40-23w4, TD 6,059 ft.

Clover Bar 1, LSD 6, 35-52-23w4, TD 4,867 ft.

Imperial-Jasper Place 1, LSD 5, 22-53-25w4, TD 5,790 ft.

Northern Development-Albercan-Lea Park-Realty 1, LSD 2, 27-51-25w4, TD 4,020 ft.

Sun et al Ferintosh 1, LSD 15, 6-44-20w4, TD 5,590 ft.

Ajax-Holden 1, LSD 5, 35-49-15w4, TD 3,820 ft.

Transcontinental-Yankee 1, LSD 16, 14-50-7w4, TD 1,500 ft.

EASTERN CANADA

CHATHAM, Ont.—On the Bruce Peninsula west of Georgian Bay in Ontario, Bruce Oil & Gas Co., Detroit, is drilling a Trenton lime test in the forest reserve south of Miller Lake, and 45 miles northwest of Owen Sound. C. D. Innes, Ohio geologist, is in charge and Trenton contact is expected around 1,400 ft.

Extensive leasing has been carried out in the Bruce Peninsula, with Bruce Oil & Gas holding around 24,000 acres, including 5,400 acres on the northeast tip of the peninsula. Imperial Oil has some 100,000 acres leased, and Hodopar Oil & Gas Co. about 25,000 acres.

The Trenton lime underlies Bruce Peninsula at around 1,400 ft., much higher than in the southwestern Ontario Peninsula, where Trenton oil and gas production has been found in isolated wells around 3,000 ft. Formation extends northwest to Manitoulin Island, where at one time extensive drilling resulted in numerous short-lived oil strikes. Some years ago gas production was discovered in several wells near Hepworth in Bruce County, south of the present drilling. Production was encounterd around 1,425 ft. and marketed to Hepworth village.

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South Louisiana

Pan Am Cores Several Gas-Condensate Shows

NEW ORLEANS.—Two and one-half miles southeast of Pecan Lake field, Cameron Parish, Pan American Production Co. has cored an extensive gas-condensate section at 1 Miami Corp., 4-15s-3w. The shows, extending in broken streaks over a 203-ft. section, were logged on cores at 12,015-12,114 ft., 12,121-31 ft., 12,146-54 ft., 12,224-34 ft., 12,234-40 ft., 12,240-50 ft., 12,250-60 ft., 12,300-10 ft., 12,320-30 ft., 12,330-40 ft., 12,340-50 ft., 12,350-58 ft., 12,368-78 ft., and 12,378-88 ft.

After setting pipe through the shows, the venture was deepening toward 13,000 ft. for additional exploration. Gas sands of considerably less thickness were detected higher up the hole. A 12-ft. gas section was logged around 8,845 ft.; A 70-ft. zone around 10,235 ft.; a 45-ft. sand around 10,700 ft.

Sinclair Oil & Gas Co. has run casing at 1 Turner Lumber Co., wildcat in 29-2s-6e, Avoyelles Parish, prior to testing. The hole is bottomed at 11,908 ft., and operator set pipe on bottom. Sinclair will test sand at 11,724-69½ ft. which, when cored, had good oil odor and showed porosity and fluorescence throughout the 45-ft. section. Plans are to drill ahead to 13,000 ft. before starting production tests.

Ellis field of Acadia Parish, has been extended at Sun Oil Co. 1 Armco, 22-9s-1w. Through perforations at 12,031-51 ft., the well flowed 382 bbl. of 41.5°-gravity oil daily through 8/64-in. choke. Tubing pressure was 5,200 psi. Hole is bottomed at 12,503 ft. with 7-in. pipe set at 10,900 ft. and 5-in. liner from 10,698 ft. to total depth.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Iberia Parish: New pay at Fausse Pointe—The Texas Co. 6 Kling-Walet, 21-11s-8e, TD 15,512 ft., perf. 14,198-14,200 ft., 468 bbl. oil per day, 10/64-in. choke, TP 5,200 psi., gravity 36.4°.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Bateman Drlg. Co. 1 J. O. Dolby et al, 2-7s-12w, dry, TD 5,268 ft.

Lafourche Parish: Herman Brown 1 J. Marcello, 60-15s-17e, dry, TD 10,519 ft.

Rapides Parish: Kemp Drlg. Co., Humble, and Gulf 1 R. O. Martin, 32-4n-1e, dry, TD 8,412 ft.

Terrebonne Parish: Union Producing and Gulf Producing 1 State Lease 1743, Twp. 19s-17e, dry, TD 14,887 ft.

Texas Gulf Coast

Goose Creek Field Gets New Shallow Sand Pay

HOUSTON.—A new pay sand in Goose Creek field, Harris County, has yielded a flow of 1,000 bbl. of oil daily through 16/64-in. choke. The strike, Carter Taylor 1 Otis E. Donahoe, was drilled to 4,650 ft., and operator ran 5½-in. casing to that depth. Perforations were effected at 4,616-20 ft. A later gage through 7/64-in. choke recorded a flow of 400 bbl. per day. Tubing and casing pressures equalized at 450 psi. but later reports have shown a rise in tubing pressure. This is apparently one of the largest oil wells to date in the recent development of Goose Creek, and will probably lend impetus to a large drilling campaign for this area.

Callery & Hurt have recompleted 1-B Inman, wildcat in Newton County, as an oil well. It was previously completed as a gas strike at 10,598-10,606 ft. and 10,616-30 ft. Operators reperforated at 11,354-88 ft. and the well flowed 195 bbl. of 47.5°-gravity oil daily through 9/64-in. choke. Tubing pressure was 3,000 psi. Location is in F. H. Pollard Survey, Abstract 340.

One and one-fourth miles southwest of Durkee field, Harris County, Union Producing Co. has dually completed the 1 Hurt as a gas well, to open a new pay for the area. Through perforations at 7,910-30 ft., the well flowed 10,000,000 cu. ft. of gas daily on open-flow gage. The Look sand, which produces in the field, was perforated at 7,242-47 ft., from which the well made 25,200,000 cu. ft. of gas daily on open flow. Total depth is 8,010 ft. with 7-in. casing set on bottom.

Wilcox oil pay has been established in Plummer field, Bee County, at Midstates Oil Corp. 1 Zeno Barber. The Slick sand was perforated at 6,688-6,700 ft. and the well flowed 106 bbl. of oil through 3/16-in. choke. The regular Plummer field pay, Machkank sand, was perforated at 7,004-07 ft. and the well flowed 66 bbl. of 36.2°-gravity oil daily through 7/64-in. choke. Tubing pressure was 750 psi.

The first oil production in the Magnolia Beach area, Calhoun County, has been opened at Alcoa Mining Co. B-1 Mary A. Hubbard. Through perforations at 8,707-11 ft., the well was completed for 201 bbl. of 39.4°-gravity oil daily. Tubing pressure was 1,090 psi. The well is 7,000 ft. north-northeast of 1 Goggins, gas-condensate discovery well at Magnolia Beach.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Bee County: Midstates Oil Corp. 1 Zeno Barber, C. B. Shain Sur., A-305, TD 7,110 ft. Slick (new pay) 6,688-6,700 ft., 106 bbl. oil per day, Mackhank 7,004-07 ft., 66 bbl. oil per day, gravity 36.2°.

Calhoun County: Alcoa Mining Co. B-1 Mary A. Hubbard, G. H. Hall Survey, TD 8,744 ft., perf. 8,707-11 ft., 201 bbl.

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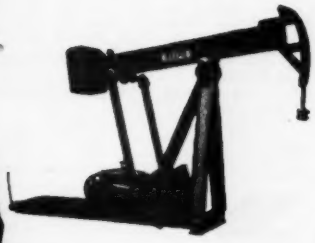

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oil per day, 10/64-in. choke, gravity 39.4°.

Quintana Petroleum Corp. 1 W. C. Melbourn, I&GN RR Co. Sur., A-97, TD 9,192 ft., perf. 7,800-06 ft., 122 bbl. oil per day, ¼-in. choke, gravity, 42°.

Harris County: New pay at Durkee—Union Producing Co. 1 Hurt, Phillip Thompson Sur., A-768, TD 8,010 ft., perf. tubing 7,910-30 ft., 3,707,000 cu. ft. of gas per day, ¼-in. choke, perf. Look sand, 7,242-47 ft., 4,052,000 cu. ft. of gas per day.

Newton County: Callery & Hurt, Inc., B-1 T. E. Inman et al., F. H. Pollard Sur., A-340, TD 11,888 ft., perf. 11,354-86 ft., 195 bbl. oil per day, 9/64-in. choke, gravity 47.5°.

Wharton County: Mac Drilling Co. 1 Joe Tobola, I&GN RR Sec. 14, A-236, TD 4,560 ft., perf. 3,907-10 ft., 3,109,000 cu. ft. of gas per day, 5/16-in. choke, TP 1,336 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: The Texas Co. 1 Sterling F. Dugat et al., F. B. Malone Sur., A-527, dry, TD 7,500 ft.

Chambers County: Gulf Oil Corp. 1 I. J. Hankamer et al., Vincent Barrow Sur., A-39, dry, TD 7,790 ft.

Jackson County: Union Producing Co., 1 S. G. Druyshel, Rodriguez Sur., A-64, dry, TD 5,100 ft.

Jackson County: D. M. Wallace and Bolsa Chica Oil Corp. 1 P. K. Miller, Juan Fernandez Sur., A-21, dry, TD 6,050 ft.

Liberty County: Freeport Sulphur Co. et al., 1 E. W. Bout et al., J. H. Chism Sur., A-163, dry, TD 10,519 ft.

Live Oak County: Louis H. Haring, Jr., Kirkwood & Co., Stanolind Oil & Gas Co. 1 Elwood C. Probst, Stephen Dincans Sur., A-161, dry, TD 6,623 ft.

Harry Hotchkin 1 W. Kiska, John Hefferman Sur., A-11, dry, TD 1,715 ft.

Montgomery County: Placid Oil Co. 2 Central Coal & Coke Co., William Nettles Sur., A-402, dry, TD 10,015 ft.

Waller County: H. J. Strief 1 Robert Kellner et al., William Cooper Sur., A-20, dry, TD 3,159 ft.

Eastern Texas

Grayson County in Line for New Oil Creek Sand Play

DALLAS—Grayson County was expected to be in line for another Oil Creek sand play as George W. Humphrey 1 Barnes developed gas and distillate from that sand body, but from a lower level than that which produces in the Sandusky area a few miles to the west.

Top of the Oil Creek in the 1 Barnes was 10,245 ft., and drill-stem test was from 10,244-69 ft. Gas flowed in 35 minutes, estimated at 10,000,000 to 15,000,000 cu. ft. daily. Gas-oil ratio was not estimated but recovery in the pipe was 467 ft. of distillate. Flowing pressure was 2,760 psi. and 20-minute shut-in pressure reached 4,390 psi. Operators drilled ahead.

The new well is an offset to a completed Pennsylvanian well, drilled after the 1 Barnes had developed oil from three sections at 3,500-3,600 ft., 5,250-5,375 ft., and 7,025-60 ft.

L. O. McMillan 1 D. A. McCoy, southeast of the original Ellenburger discovery of the Sandusky field, was dry at 7,629 ft. The well developed some oil but was not a commercial producer. Top of the Simpson was 6,902 ft., with elevation estimated at 665 ft. Test from 6,812-25 ft. recovered 630 ft. of gas-cut mud and 64 ft. of oil-cut mud. From 7,630-62 ft., recovery was 550 ft. of oil and gas-cut salt water.

Northwest of Sherman, Standard Oil Co. of Texas 1 McKeon had pumped 89 bbl. of oil and 11 bbl. of water on a 11-hour pumping test on perforations at 5,131-41 ft.

EAST TEXAS (DISTRICTS 5 AND 6) SUCCESSFUL WILDCAT

Marion County: Natchez Producing Co. 1 Dollie Key, Wm. Mason Sur., 4 mi. SE Jefferson, TD 6,565 ft., elev. 189 ft., Pettit 6,486 ft., perf. 6,450-89 ft., 75,000,000 cu. ft. of gas a day, plus 40 bbl. 64°-gravity distillate per 1,000,000 cu. ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Grayson County: Mid-Continent Petroleum Corp. and Skelly Oil Co. 1-D Chiles est., J. Chiles Sur., A-268, 2½ mi. NW Pottsboro, dry, TD 8,559 ft., elev. 779 ft., Strawn sand 4,262 (?) ft.

Star Oil Co. 1 C. A. Walling, H. Lewis Sur., 2 mi. E Tioga, dry, TD 4,260 ft., elev. 684 ft., Viola 3,758 ft., Simpson 3,815 ft.

Hunt County: J. C. Harper 1-A V. T. Banks, J. W. Haynes Sur., dry, TD 2,723 ft., elev. 565 ft., sub-Clarksville 2,454 ft., Woodbine 2,723 ft.

Morris County: W. M. Coats 1-B Even Reese, TCRR Sur., dry, TD 5,010 ft.

Navarro County: E. V. McCright 1 R. L. Griggs, H. Bush Sur., dry, TD 4,085 ft., elev. 373 ft., Woodbine 3,470 ft.

Robertson County: Tri-Mark Oil Co. 1 W. C. Anderson, J. Webb Sur., dry, TD 2,311 ft.

Smith County: J. E. Fleming 1 J. N. Lyons, W. Middleton Sur., dry, TD 5,721 ft.

Titus County: W. B. Hinton 1 L. H. Wilson, J. H. Dew Sur., dry, TD 7,744 ft., elev. 420 ft., Paluxy 5,360 ft., Pittsburgh 7,490 ft., Travis Peak 7,517 ft.

Wood County: Edson Petroleum Co. 1 J. R. Mitchell, J. B. Chirino Sur., dry, TD 5,013 ft.

Hollandsworth Oil Co. 1 Kilpatrick-Fauke, W. J. Clark Sur., dry, TD 5,714 ft.

B. B. Orr 1 E. M. Dashiel, W. P. Kin-

DATE
WELL NO.
PUMPER'S SIGNATURE
REMARKS
PUMP SANDS IN DURING SHUT-DOWN PERIOD - When well is shut down, sand and well trash settle from fluid column and enter pump bore through discharge openings (conventional type pump). Owing to sandy nature of fluid and frequent shut-downs, plunger becomes sand locked often. Pulling the column of rods and tubing and bailing operations are unprofitable in view of limited production obtained from stripper-type well. Need a pump especially designed for stripper wells that will not sand up.
Discharge ports to outer jacket tube annulus
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Exclusive H-F cage design permits easy passage of fluid, and quick closing of valve on each stroke
Fluid is discharged into production column near bottom of pump. Sand and well trash are agitated upward and away from vital parts of pump
3 cup bottom hold-down
H-F
Sub-Surface
PUMPS

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Rod Pumps

The discharge ports of this special stripper well pump are completely enclosed by an outer jacket tube that reciprocates with the rods and plunger. Fluid, discharged through the plunger, passes through ports in the barrel tube into the outer jacket annulus and is agitated into the fluid column during the pumping cycle. When the pump is idle, it is impossible for settling matter to sand in the plunger because the discharge ports are not directly exposed to the fluid column.

Full Details are available in a completely-illustrated technical bulletin available without obligation through local supply stores or by writing us at Box 64, Fort Worth, Tex.

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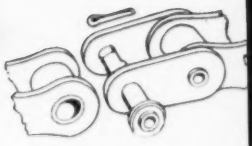
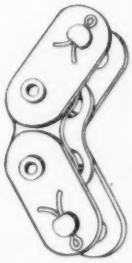
ease of assembly?

With the Baldwin-Rex "BA"* Riveted Roller Chain, assembling or disassembling roller chain in the field or in the supply store is the easiest you've ever known. Just locate the special connector link, remove the cotter and drive out the pin. That's all there is to it. No danger of damaging parts or fits as with ordinary riveted chain.



ease of adjustment and repair?

Keep a supply of "BA" 3 Pitch repair units on hand. They're your insurance against loss of drilling time. If a chain becomes damaged while in service, it can quickly be fixed right on the job by inserting one or more repair units. What's more, "BA" repair units are interchangeable with any standard roller chain.



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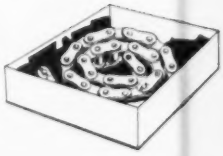
The "BA" Assembly is shipped in boxes containing two standard 5-foot lengths of chain. Each strand contains two single pin connectors at approximately the 2′ and 5′ mark. Thus, it's easy for you or your supply store to *build up* exact length of chain you need without "cutting" chain. Standard "BA" short units of various lengths are available for this purpose. Offset links can also be added and then removed to compensate for chain elongation.



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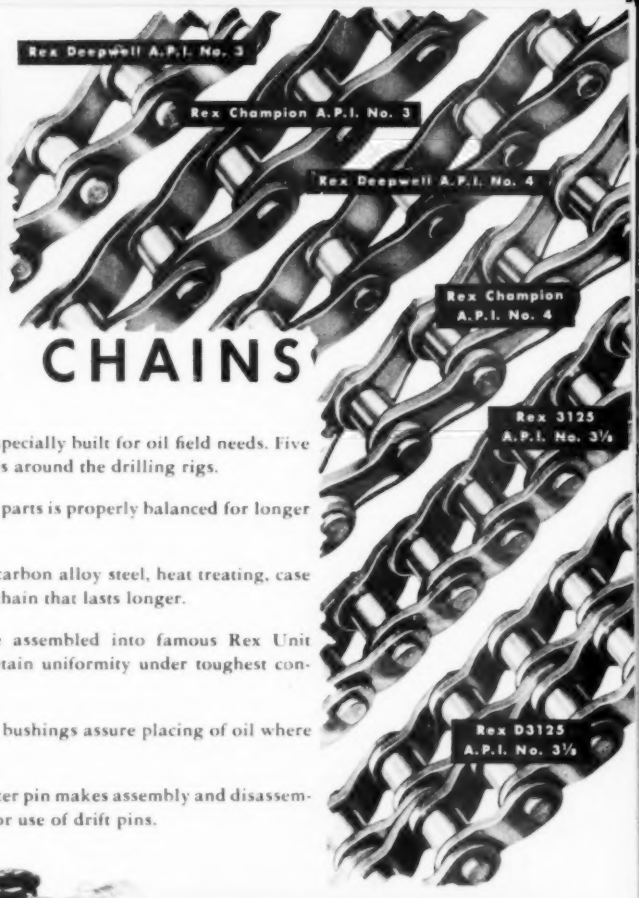

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kennon Sur., dry, TD 5,498 ft., elev. 529 ft., sub-Clarksville 4,718 ft.
J. C. Robbins 1 W. E. James, R. C. Betty Sur., dry, TD 5,470 ft.

Illinois-Ind.-Ky.

Three Zones Show Oil in Effingham County Wildcat

A PROMISING new oil discovery appears to have been made by The Texas Co. at its 1 Sinnickson, NW SW NW 10-6n-5e, southern Effingham County, Illinois. The well, located 2 miles north of Mason and 1½ miles north of the small pool by the same name, is a prospective producer in at least three horizons: The Benoist (Bethel) sand, topped at 2,230 ft.; the Aux Vases sand, topped at 2,312 ft., and the Rosiclare lime at 2,367-78 ft.

Two drill-stem tests were made in the Benoist sand. The first, at 2,225-45 ft., recovered 120 ft. of oil with a substantial showing of gas. Bottom-hole pressure was 770 ft. The second, at 2,245-55 ft., got 60 ft. of oil and 90 ft. of mud-cut oil. Bottom-hole pressure was 697 psi. Tester was open 2 hours in each instance.

A 2-hour test in the Aux Vases zone, taking in an interval at 2,305-20 ft., yielded 30 ft. of slightly oil-cut mud with 60 ft. of water. Bottom-hole pressure was 730 psi. A 2-hour test of the Rosiclare lime (2,367-78 ft.) filled 240 ft. of oil, 90 ft. of mud-cut oil and 60 ft. of water.

Calvert Drilling, Inc., 1 Gallagher, NE NW SE 13-2n-8e, 1½ miles from other production in the east side of the Clay City-Noble Consolidated pool, in the area about 5 miles southeast of Clay City, Clay County, Illinois, recovered 420 ft. of clean oil, 360 ft. of mud-cut oil and 120 ft. of mud in a drill-stem test of showings encountered in McClosky lime. The test was of an interval at 2,989-3,007 ft.

A new Cypress sand pool is indicated in northeastern Washington County, Illinois, where James N. Hockman has run casing in his 1 Riechman, NW SE NW 25-1s-1w. Total depth is 1,538 ft. with bottom still in saturation. Cypress was logged from 1,531 ft. A 60-minute drill-stem test at 1,527-38 ft. got 200 ft. of clean oil. Casing is at 1,532 ft. The area is 9 miles south of Centralia and about 1 mile southeast of the Irvington pool.

The Epworth pool, 3 miles southeast of Carmi, in White County, Illinois, is being extended ½ mile to the north at Skiles Oil Corp. 1 Strophlet, NE SE SE 29-5s-10e, which filled 1,060 ft. of oil and 60 ft. of oil-cut mud in a 60-minute drill-stem test of Aux Vases sand at 2,996-3,007 ft. Casing has been run to 2,990 ft. for completion.

Sam D. Jarvis and Lohman & Johnson Drilling Co. have completed their 1 Helderman, S½ SW NE SE 21-2n-8w, 4 miles southeast of Monroe City, Knox County, with an initial production of 50 bbl. of oil per day on the pump. It opens a new pool, 2 miles from nearest other production in the Monroe City area, and is the first Aux Vases well in that general area. Pay is at 1,314-23 ft. with hole open below 1,306 ft.

G. L. Reasor got a good oil flow (no gage) after drilling plug in his 2 Wimsatt, 19-P-27, on the southeast edge of the Birk City pool, in Daviess County, western Kentucky. Pay zone is Renault lime at 1,858-64 ft. Oil flow was natural. Since then the pay zone has been treated with 2,000 gal. of acid, and at latest report the well was being cleaned out for further testing. Location, not far from the Henderson County line, is 1 mile southeast of Birk City and 2,000 ft. from nearest production.

ILLINOIS SUCCESSFUL WILDCATS

Edwards County: V. R. Gallagher 1 Smith, NW NW SW 18-1s-14w, IP 50 bbl., Waltersburg 2,310-30 ft., TD 3,190 ft. (extends Bone Gap pool).
Richland County: Calvert Drilling, Inc., 1 Tarpley, SE SE SE 16-2n-14w, IP 335 bbl., McClosky 3,063-78 ft., TD 3,099 ft.

ILLINOIS WILDCAT FAILURES

Clinton County: Louis Holst 1 Calkins, SW SE NE 30-2n-1w, dry, TD 1,424 ft.
Arnold Wilson Corp. 1 Hediger, SE NE SE 10-3n-3w, dry, TD 1,156 ft.
John F. Dunnill 1 Trame, SW SE NW 11-3n-4w, dry, TD 1,229 ft.
Dewitt County: J. S. Young, Jr., 1 Shinneman, SE NW NW 11-19n-4e, dry, TD 1,583 ft.
Fayette County: C. J. Simpson Drilling Co. 1 Halford, NE NE NE 22-8n-1w, dry, TD 1,639 ft.
Franklin County: T. S. Doran-Winmar Oil Co. 1 U. S. Steel, SW SW SE 25-6s-4e, dry, TD 3,354 ft.
Jasper County: Don Baines 1 Lux, NE NE NW 28-8n-8e, dry, TD 2,880 ft.
Lawrence County: Big Four Oil & Gas Co.-Hayes Drilling Co. 1 Eaton, NE NE SW 25-3n-13w, dry, TD 2,228 ft.
Marion County: Norman Appleby et al 1 Blair, NE NE SW 12-1n-2e, dry, TD 2,407 ft.
Duane E. Wollner 1 Edgeworth, NW SE NW 35-2n-3e, dry, TD 2,775 ft.
Montgomery County: Lewis T. Lohman et al 1 German, NW NW SE 18-10n-1w, dry, TD 2,773 ft.
Richland Connty: Frank Ellison-D. B. Bayles 1 Williams, 1-2n-14w, dry, TD 3,091 ft.
N. C. Davis et al 1 Seiler, SW SE SW 32-5n-14w, dry, TD 3,039 ft.
Wayne County: Ashland Oil & Refining Co.-C. E. O'Neal 1 Van Fossan, NE NW SE 12-1s-8e, dry, TD 3,226 ft.

INDIANA SUCCESSFUL WILDCAT

Knox County: Ivan White 1 Black, Military Donation 230-2n-8w, IP 75 bbl., Rosiclare 1,511-15 ft., TD 1,517 ft.

(Continued on page 218)

THESE CLEAN CUTTINGS MEAN MORE PRODUCTION — CLEANER HOLES

A seismograph crew drilling shot holes in South Texas drilled a clean, straight 80-foot hole through hard shale, clay and gravel in 20 minutes. Notice in the photograph above, the extra clean cuttings of uniform size made by the Hawthorne "Blue Demon" Rock Cutter Bit.

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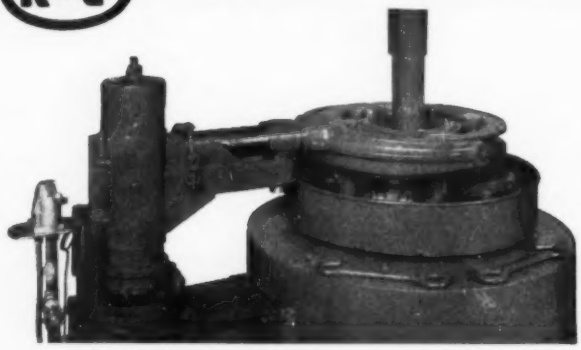

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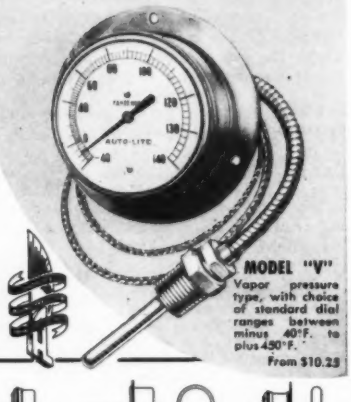

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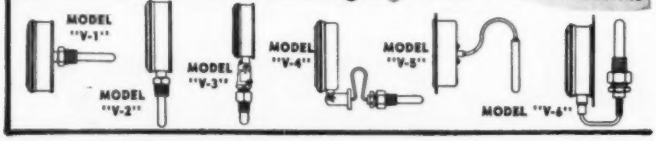

Southwest Texas

Milam County Wildcat Finds Edwards Pay

CORPUS CHRISTI—A small Edwards lime discovery has been completed in Milam County at D. H. Byrd 1 M. Blakeley, A. J. Watts Survey. The Edwards pay was topped at 5,736 ft., and the venture made hole to 5,739 ft. Operator set 5½-in. casing at 5,736 ft. for open hole completion attempt. The well pumped 20 bbl. of 31.4°-gravity oil daily.

Sunray Oil Corp. has recompleted a gas well in Dagger Island field, Nueces County, to open a new pay for the area. The 1 State Lease 352 was drill-stem tested at 8,180-87 ft. in a new pay, and flowed water cushion in 15 minutes and gas and condensate the remaining 45 minutes. Working pressure registered 3,000 psi. Operator plans to test several other sands before final completion of the well.

Gus Tsemelis is running pipe in the 1 Otto Goldaop, Jim Wells County wildcat, to test two zones, one oil and one gas. The gas sand will be tested around 3,500 ft., and the oil sand around 3,300 ft. The gas section was detected on a drill-stem test at 3,470-3,507 ft. Working pressure was 300 psi., and bottom-hole pressures were 1,400/1,500 psi. This zone is above the gas pay at West Alice field, ½ mile to the southeast. Details on the oil showing have not been reported.

On the northwest flank of Amargosa gas field, Jim Wells County, George W. Graham 1 Martha E. Dilworth had oil shows in sidewall cores at 6,360 ft., 6,484 ft., and 6,720 ft. The well is bottomed at 7,000 ft. and operator set casing at that depth prior to testing. At last report, the well had been perforated at 6,720-28 ft.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Duval County: F. William Carr et al 1 A. G. Black, Pedro de la Cerda Sur., TD 4,437 ft., perf. 4,432-36 ft., 88 bbl. oil per day, ⅛-in. choke, gravity 44°.

Frio County: Goldston Oil Co. 1 Anna Weitting, Dan Price Sur. 6, A-1026, TD 4,079 ft., Navarro 3,682-3,725 ft., 11 bbl. oil per day, gravity 44°.

Nueces County: New pay at West Bishop—Eastern States Petroleum Co., Inc., 1 H. A. Pearson, F. Z. Bishop subd. of Weil ranch, TD 7,805 ft., middle Pfluger 7,231-46 ft., 11,500,000 cu. ft. gas per day, open flow, upper Pfluger, 7,211-14 ft., 2,200,000 cu. ft. gas per day, open flow.

New pay at Dagger Island—Sunray Oil Corp. 1 State Tract 394, in Redfish Bay, TD 8,400 ft., perf. 8,330-37 ft., 199 bbl. oil per day, gravity 40.5°.

New pay at Dagger Island—Sunray Oil Corp. 1 State Tract 395, in Corpus Christi Bay, TD 8,400 ft., perf. 8,018-25 ft., 162 bbl. oil per day, 10/64-in. choke, gravity 38.9°.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Appel Drilling Co. 1 M. R. Forister, Mark H. Moore Sur. 185, A-559, dry, TD 6,000 ft.

Sloan Oil & Gas Co. 1 Mary Taylor, I&GN RR Sur. A-1116, dry, TD 2,904 ft.

Bastrop County: Amerada Petroleum Corp. 1 Florence Schuelke, Jesse Holderman Sur., dry, TD 6,622 ft.

J. H. Ledlow 1 Annie Lee Alexander, W. Eastland League 30, AAA-157, dry, TD 4,196 ft.

Bell County: Stefka-Chandler Oil & Gas Exploration Co. 1 J. A. Mikus-M. Davila 11-League Grant, dry, TD 1,570 ft.

Bexar County: Traders Oil Co. of Houston 1 Pfeil, Eligio Gortori Sur. 2, A-5, dry, TD 878 ft.

Brooks County: Chicago Corp. 3 Boedeker ranch, CCSD&RGNG RR Sur., Sec. 7, dry, TD 2,569 ft.

(Continued on page 219)

Mississippi

Franklin Test Logs Oil Sand

JACKSON.—Franklin County has promise of a discovery 1 mile north of South White Apple field at Sun Oil Co. 1 J. D. Seab, 45-6n-1e. Electric log indicated oil sand at 6,423-31 ft. and 6,464-66 ft. Sun drilled the test to 7,007 ft. in the Wilcox and set casing at 6,505 ft. prior to testing. The sand which is being tested at South White Apple field shaled out in the 1 Seab.

Union Producing Co.-Jones-O'Brien 1 Logan, 23-10n-3w, Smackover test on the west side of the Tinsley field, Yazoo County ,cored at 14,074-14,124 ft. in sidetracked hole with recovery being limestone and nonporous sand with a strong odor of hydrogen sulfide. It is reported that another core has been cut, which would put the bottom of the hole a few feet deeper than the original hole which blew out from the Smackover. A drill-stem test has been conducted, but operators are temporarily holding up all information on the last core in the test.

In northern Wayne County, Gulf Refining Co. 1 H. A. Chapan, Sr., A. 19-10n-6w, encountered a possible gas show in a Lower Cretaceous sand. A drill-stem test was run at 9,090-9,108 ft., but on the first attempt tool joint leaked.

MISSISSIPPI WILDCAT FAILURES

Adams County: John S. Callo 1 Dessie Haynes, 30-1n-2w, dry, TD 6,520 ft.

Sunray Oil Corp. 1 James O'Kelley, 48-6n-2w, dry, TD 6,713 ft.

Claiborne County: Phillips Petroleum Co. 1 J. Davenport-H. King est. unit, 68-22n-2e, dry, TD 11,506 ft.

Tip Ray-D. C. Latimer 1 Mrs. G. F. Disharoon et al, 40-22n-3e, dry, TD 6,084 ft.

Smith County: The Texas Co. 1 Smith County Oil Co., 31-2n-7e, dry, TD 8,417 ft.

Wilkinson County: Sinclair Oil & Gas Co. 1 H. H. Jensen, 21-4n-3w, dry, TD 7,515 ft.

Louisiana-Arkansas

Webster Prospect Gets First Offset

SHREVEPORT.—A confirmation well to a prospective oil strike has been located in Section 13-19n-11w, Webster Parish. The new venture, offset to Skelly Oil Co. 1 Stewart in Section 19-19n-10w, is Pan-American Production Co. 1 McCloud, scheduled to drill to 5,000 ft.

The 1 Stewart, now drilling ahead below 7,600 ft., recovered 2,700 ft. of oil on a 1-hour drill-stem test at 4,002-13 ft.

Carter Oil Co. has staked a rank wildcat in Morehouse Parish, 12 miles south and east of Oak Grove. The 1 Hope fee, C SW NE 7-21n-9e, will be a 6,500-ft. Smackover test. Earlier this year Sunray Oil Corp. drilled another Smackover test, 1 Schenley, SE NW 27-22n-8e, which went to 6,089 ft. with no shows. The new venture is some 13 miles northwest of Epps gas field and slightly more than that distance northeast of Monroe gas area.

In Arkansas, the Bear Creek area of Union County may gain new production at McAlester Fuel Co. B-1 Southern Co., 4-16s-17w. The well had 425 ft. of oil and 30 ft. of oil and water-cut mud on a 15-minute drill-stem test of the Travis Peak at 3,778-85 ft. Bottom-hole flowing pressure was 650 psi., shut in 1,725 psi.

NORTH LOUISIANA WILDCAT FAILURES

Concordia Parish: Hunt Oil and Gulf Oil 5 Metropolitan Museum of Arts, 660 ft. S and 400 ft. W of NEc 3-3n-7e, dry, TD 7,517 ft.

Grant Parish: McAneny et al 1 Taylor, C SW NE 10-6n-2w, dry, TD 5,409 ft.

ARKANSAS WILDCAT FAILURES

Ouachita County: Carnes et al 1 Reynolds, NW SE NE 20-14s-16w, dry, TD 2,717 ft.

Union County: Shell Oil 2 U.S.M., SE NE SE 7-17s-12w, dry, TD 3,308 ft.

Appalachian-Ohio

Two Wildcats Staked In West Virginia

PITTSBURGH.—In Portland district, Preston County, West Virginia, Hope Natural Gas Co. located 9670 Baltimore & Ohio Railroad Co., elevation 2,168 ft., Kingwood Quadrangle, 5½ miles south of Lat. 39° 30' and .2 mile west of Long. 79° 35'.

In St. George district, Tucker County, Lawrence Parshall located 1 Floyd Stahl et al, elevation 1,850 ft., Parsons Quadrangle, 2.65 miles south of Lat. 39° 15' and 4 miles west of Long. 79° 30'.

In Clover district, Hope Natural Gas Co. 9384 Herbert Shaffer, elevation 2,401 ft., passed through the Oriskany sand with no gas and is drilling at 5,932 ft. in the Helderberg lime, which was topped at 5,832 ft.

Eberly & Snee 1 Eli Beechie is shut down at 4,180 ft. The Onondago was topped at 4,125 ft. with a show of gas at 4,133 ft.

MARYLAND WILDCAT FAILURE

Garrett County: Mid Atlantic Oil & Gas Co. 1 Stewart Hammel, elevation 2,504 ft., dry, TD 4,004 ft.

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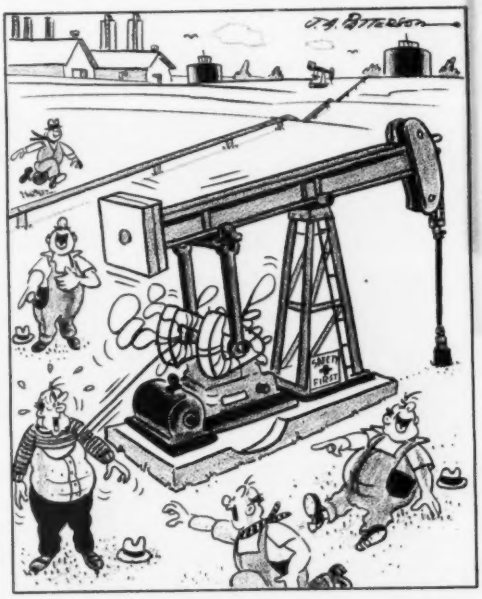


THE OIL AND GAS JOURNAL

"Somebody hurry and turn th' fool thing off!"

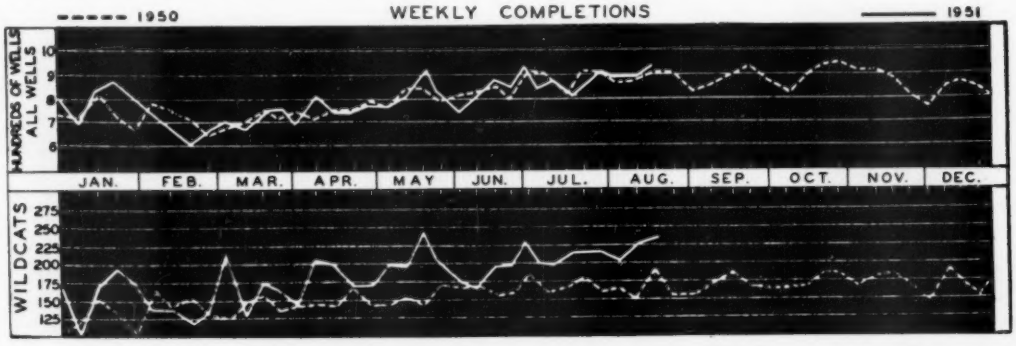
CURRENT STATISTICS

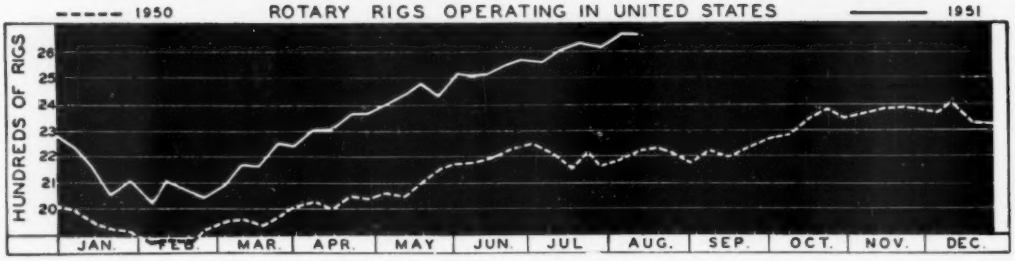
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . WEEK ENDED AUGUST 18, 1951

	Total of all wells					Aug. 18		Wildcat completions and discoveries									
													Cumulative total, 1951				
	Comp.	Oil	Gas	Dry	Footage	1951	1950	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	17	9	0	*8	24,167	385	423	0	0	0	0	0	0	0	0	0	0
Pennsylvania	16	6	4	†6	24,469	856	863	0	0	0	0	0	0	0	0	1	1
West Virginia	5	1	2	2	16,156	351	419	0	0	0	0	0	0	0	7	5	12
Ohio	20	5	2	13	50,789	580	621	0	0	0	0	0	1	0	5	16	22
Indiana	37	17	0	20	72,375	753	973	2	0	0	11	13	27	0	1	203	231
Kentucky	24	10	5	9	54,943	721	674	0	0	0	2	2	15	0	1	104	120
Illinois	57	27	0	30	143,371	1,471	1,657	2	0	0	14	16	40	0	0	324	364
Michigan	20	5	1	‡14	45,505	484	535	0	0	0	6	6	15	0	6	188	209
Kansas	106	53	11	‡42	347,588	2,708	2,376	5	1	0	23	29	139	1	11	548	699
Nebraska	5	1	0	4	25,408	143	54	0	0	0	4	4	4	0	1	70	75
Oklahoma	130	71	6	§53	492,557	3,493	3,402	4	0	0	18	22	120	2	15	450	587
Texas	329	196	14	119	1,546,255	10,456	10,284	16	1	4	74	95	459	37	79	2,120	2,695
North Central (Dist. 7-B & 9)	83	44	1	¶38	271,172	3,180	3,140	6	0	1	23	30	227	2	11	906	1,146
West (Dist. 7-C & 8)	92	76	0	16	508,910	3,144	3,079	2	0	0	11	13	103	9	5	400	517
Panhandle (Dist. 10)	19	8	9	2	60,616	438	569	0	0	0	1	1	2	0	0	15	17
Eastern (Dist. 5 & 6)	30	13	0	17	152,352	763	746	0	1	0	12	13	6	5	0	148	159
Gulf Coast (Dist. 2 & 3)	52	30	3	19	325,717	1,470	1,431	4	0	2	9	15	61	14	41	301	417
Southwest (Dist. 1 & 4)	53	25	1	27	227,488	1,461	1,319	4	0	1	18	23	60	7	22	350	439
Louisiana	39	20	5	14	213,189	1,288	1,546	1	0	0	6	7	29	5	5	167	206
Northern	29	16	5	8	109,628	688	825	0	0	0	2	2	7	0	3	95	105
Southern	10	4	0	6	103,561	600	721	1	0	0	4	5	22	5	2	72	101
Arkansas	11	5	0	6	37,783	252	261	0	0	0	2	2	10	0	3	54	67
Mississippi	12	4	0	8	81,294	215	203	0	0	0	7	7	10	3	0	78	91
Southeastern States	2	0	0	2	9,098	35	42	0	0	0	0	0	0	0	0	14	14
Montana	18	12	1	5	37,513	130	142	0	0	0	2	2	0	0	0	30	30
Wyoming	17	12	0	5	77,087	453	357	0	0	0	4	4	7	0	1	60	68
Colorado-Utah	5	1	0	4	25,841	163	43	0	0	0	4	4	6	0	4	84	94
New Mexico	13	8	1	4	78,964	404	395	1	0	0	1	2	11	0	7	48	66
California	49	31	1	17	210,969	1,409	1,113	0	0	1	15	16	31	0	2	279	312
Miscellaneous	3	0	0	3	7,864	51	35	0	0	0	3	3	0	0	19	16	35
Total United States	935	494	53	388	3,623,185	**26,801	**26,418	31	2	5	196	234	924	48	167	4,859	5,998
Total previous week	896	442	53	401	3,354,435			31	1	4	190	226	893	46	162	4,663	5,764
Total August 18, 1950	906	504	50	352	3,341,463			34	0	4	152	190	691	47	121	3,924	4,783

Service wells included: *8, †6, ‡2, §11, ¶1. ‖Incl. 2 No. Dak. at 3,860 ft. and 1 Md. at 4,004 ft. **Revised.





DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 18 crude oil	B. of M. Aug. demand	Aug. 11 crude oil
Alabama	2,900	2,400	3,100
Arkansas	77,200	85,000	77,100
California	978,700	980,000	978,100
Colorado	76,900	80,000	72,300
Eastern	57,800	64,000	61,750
Florida	1,625	1,600	1,825
Illinois	162,000	165,000	170,600
Indiana	31,100	29,000	32,700
Kansas	321,050	320,000	322,950
Kentucky	30,300	29,000	30,400
Louisiana	611,725	671,000	611,225
North Louisiana	115,500		115,000
South Louisiana	496,225		496,225
Michigan	38,100	42,000	38,700
Mississippi	98,450	104,000	100,800
Montana	23,800	24,000	24,200
Nebraska	6,350	10,000	6,300
New Mexico	147,300	154,000	147,300
Oklahoma	505,700	530,000	506,400
Texas	2,772,625	2,690,000	2,772,625
Dist. 1 (Southwest)	33,575		33,575
Dist. 4 (Southwest)	257,725		257,725
Dist. 2 (Gulf Coast)	161,175		161,175
Dist. 3 (Gulf Coast)	474,250		474,250
Dist. 5 (Eastern)	55,700		55,700
Dist. 6 (Eastern)	115,600		115,600
East Texas field	271,300		271,300
Dist. 7-C (West)	104,400		104,400
Dist. 8 (West)	971,050		971,050
Dist. 7-B (W. Central)	81,900		81,900
Dist. 9 (N. Central)	159,950		159,950
Dist. 10 (Panhandle)	86,000		86,000
Utah	4,300	5,000	4,200
Wyoming	196,500	178,000	196,100
Total United States	*6,144,425	6,164,000	6,158,675
Change from prev. week, down	14,250		
Canada	175,905		150,820

Total U. S. production January 1-August 18 †1,732,458,600 bbl.
Same period last year (crude plus cond.) 1,190,064,490 bbl.

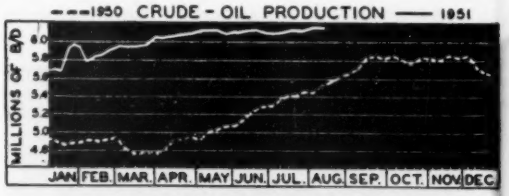
*Not including 100,190 bbl. condensate. †Including 24,248,420 bbl. condensate.

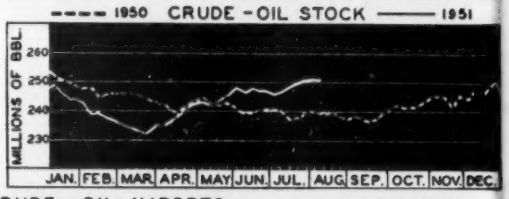
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

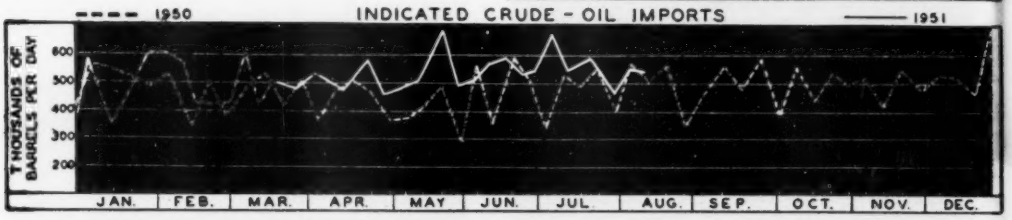
(Thousands of barrels)

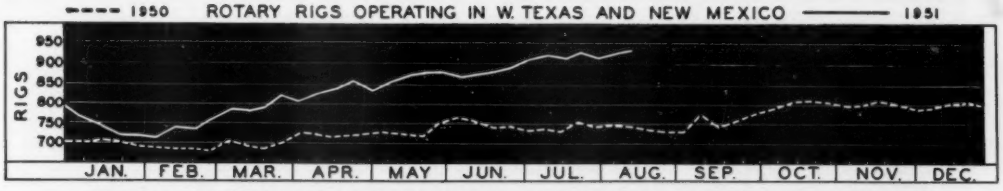
	Aug. 11, 1951	Aug. 4, 1951	Aug. 12, 1950
Pennsylvania Grade	2,154	2,221	2,745
Other Appalachian	1,411	1,455	1,488
Illinois, Indiana, Michigan	10,633	11,084	9,230
Arkansas	2,884	2,777	2,792
Louisiana	14,607	14,657	14,483
North	3,341	2,754	3,134
Gulf	11,266	11,903	11,349
Mississippi	3,108	3,021	2,266
New Mexico	6,454	6,312	6,031
Oklahoma and Kansas	39,702	38,637	33,007
Texas	118,920	119,063	113,833
East Texas	14,215	14,662	14,702
West Texas	50,366	50,488	43,526
Texas Gulf	26,315	26,168	27,391
Other Texas	28,024	27,745	28,214
Rocky Mountain	13,663	13,711	11,925
California	30,005	30,599	33,871
Foreign	7,815	8,126	6,883
Total	251,356	251,663	238,554

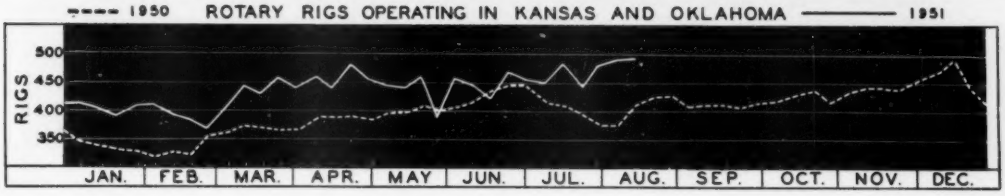
*Bureau of Mines.









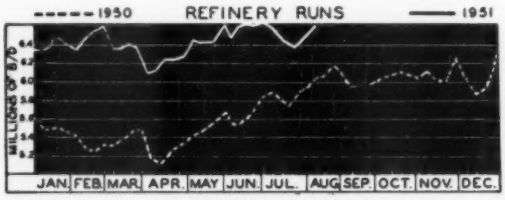


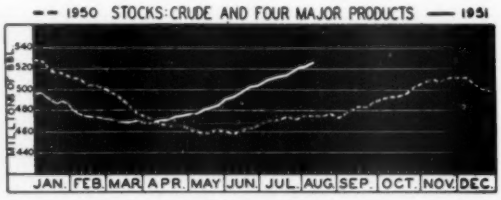
A.P.I. REFINERY REPORT, AUGUST 11

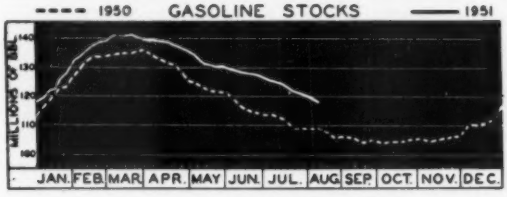
(Thousands of barrels)

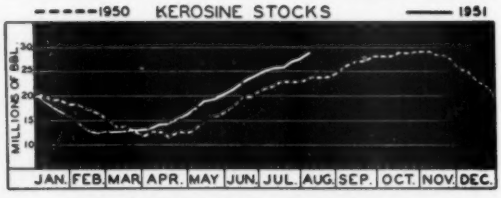
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, August 1950				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production Gasoline*	Kerosine	Distillate	Residual
East Coast	1,037	420.1	13.0	229.9	216.1	25,743	10,400	25,295	12,026	976	410.4	34.3	207.8	210.2
Appalachian:														
District 1	93	40.0	4.9	15.6	10.9	2,827	631	1,076	492	100	42.3	5.0	13.4	9.4
District 2	73	33.9	4.1	7.3	18.3	1,303	344	412	301	69	33.8	4.0	7.3	13.5
Ind., Ill., Ky.	1,187	648.4	75.7	195.3	152.3	25,800	6,396	17,482	5,399	1,070	583.3	64.0	166.9	137.0
Okla., Kans., Mo.	474	253.6	19.3	105.1	51.7	12,706	1,703	9,355	1,834	531	288.9	13.8	118.9	61.7
Inland Texas	255	168.7	18.3	32.7	42.3	3,602	554	1,463	1,069	225	140.3	10.5	32.0	40.0
Texas Gulf Coast	1,650	782.0	114.1	344.8	285.3	18,210	4,755	11,009	5,886	1,385	653.8	104.3	281.4	231.5
La. Gulf Coast	484	217.1	61.3	111.9	62.7	6,142	2,397	4,040	1,932	489	234.2	59.1	99.5	61.5
N. La. and Ark.	84	31.4	7.4	18.0	8.0	2,469	539	891	142	71	27.3	6.1	14.2	11.6
Rocky Mountain:														
New Mexico	14	7.3		2.9	3.9	127		69	32	15	8.1	.3	2.7	3.5
Other Rocky Mtn.	224	105.3	6.1	42.1	42.8	4,583	374	1,898	1,205	206	89.3	4.7	39.1	37.1
California	1,017	448.3	11.9	166.7	333.7	14,674	518	8,712	16,474	930	419.8	10.9	106.0	330.9
August 11, 1951	6,592	3,162.1	336.1	1,272.3	1,228.3	118,186	28,611	81,692	46,792	6,067	2,931.5	317.0	1,089.2	1,147.9
August 4, 1951	6,488	3,063.7	346.4	1,251.7	1,288.6	119,616	27,677	79,080	45,305					
August 12, 1950	6,044	2,900.7	303.0	1,038.1	1,112.4	108,518	23,628	63,053	41,810					

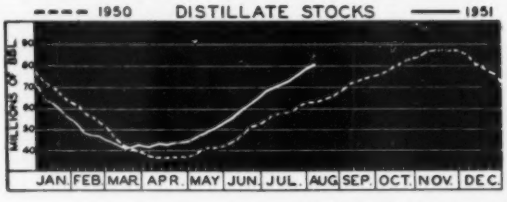
*At refineries including natural blended. †Finished and unfinished.

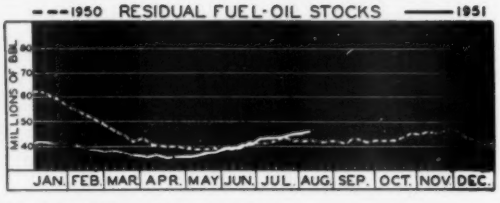


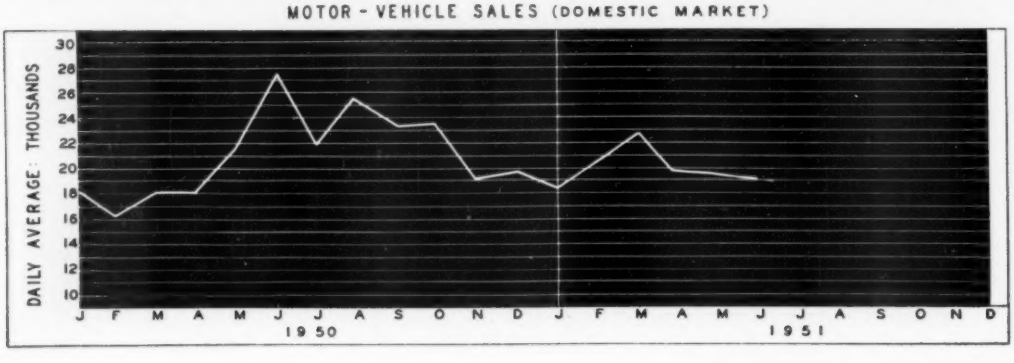












CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93	....	....	....
19-19.9	1.98	....	....	....
20-20.9	2.03	$2.25	....	$2.12
21-21.9	2.07	2.27	....	2.14
22-22.9	2.12½	2.29	....	2.16
23-23.9	2.18	2.31	....	2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.90
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.25
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

DESPITE increases in export sales of products from refineries located in Gulf Coast and East Coast districts, all of the increases in primary inventories of major products for week ended August 11 were concentrated in Districts 1 and 3. In general, this is counter to the general trend for the past several months which has resulted in large stock gains for District 2. Since only a very small part of total refinery production in District 2 is shipped out of the district, additions to major product storage will continue at least through September if refinery runs are held at current levels.

District 2 product receipts from outside the district include a small volume of tank cars, near constant movement by pipe line from District 3, and barge shipments up the Mississippi River from District 3. Out of these, only the barge movement will be influenced by export shipments from the Gulf Coast. Under Gulf Coast price ceilings, products will continue to move up the river by barge as long as there is no break in the inland markets.

Since District 2 products can not move to the Gulf Coast for export with any reasonable netback to the refiner, supply calculations for the district should be based on estimates of demand within the area.

If Iranian production is still unavailable in world markets when our heating season starts, exports out of the Gulf Coast and East Coast districts could produce a shortage in these areas at a time when inventories in District 2 are high enough to soften Group 3 and Midwest markets.

Total major product inventories are 38,272,000 bbl. or 16 per cent above last year, but almost 20,000,000 bbl. of this increase is in District 2 where the products are not available for export except to Canada.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of August 20, 1951. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10¼-10½	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	9-9⅜	10	9
No. 2 straw fuel oil	8-8⅝	9	8
No. 6 residual	$1.75-1.80	$2.45-2.60	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

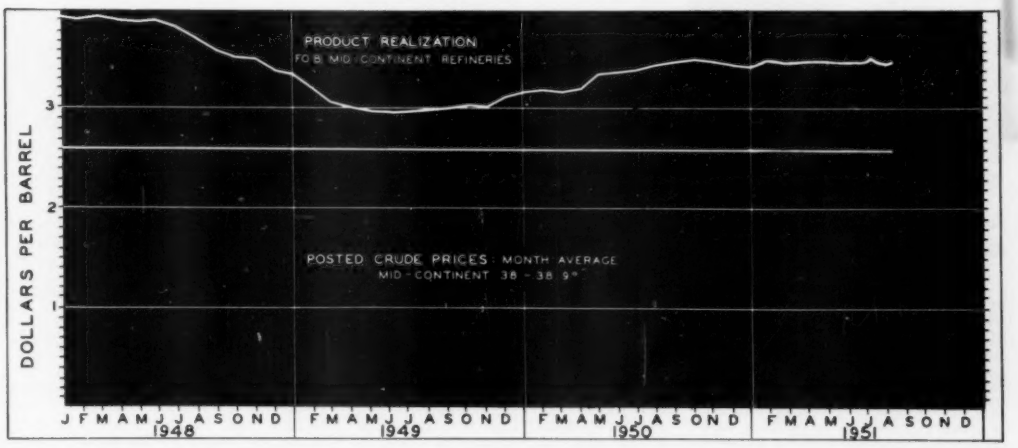
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	6.0



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.50 for week ended August 11, $3.48 for previous week, and $3.47 for August 1950.

EQUIPMENT MEN . . . in the News

General Control Names Andrews Branch Manager

S. D. ANDREWS

S. D. Andrews, who joined General Controls Co., Glendale, Calif., 3 years ago as an employe in the company's San Francisco branch, has been appointed branch manager of Dallas office, as recently announced by J. F. Ray, vice president in charge of sales. Andrews replaces Robert Farmer who will return to the Glendale plant as a factory engineer.

Andrews formerly was employed by North American Aviation and Alemite Co. of Southern California. His new position will entail complete charge of all Dallas branch office territory activities, including sales, engineering, and service on General Controls' line of automatic controls.

Rockwell Appoints Sells New Orleans Office Head

J. H. SELLS

C. K. Madison, Houston district manager, Rockwell Manufacturing Co., has appointed J. H. Sells to succeed M. F. Groom as head of the company's New Orleans office.

A graduate of Texas A. & M., Sells was formerly employed by Shell Oil Co. He joined Rockwell 3 years ago and since that time has been handling the sale of all products in the Alexandria, La., area. In his new position Sells will cover the New Orleans and Baton Rouge areas.

American Cyanamid Builds New Indiana Plant

American Cyanamid Co.'s new 3-million-dollar plant in Michigan City, Indiana, began production on August 15. This announcement was recently made by Arthur J. Campbell, general manager of the company's industrial chemicals division. The plant will produce synthetic cracking catalysts used by oil refiners in making high-octane gasoline and other high-grade fuels.

With the new plant in operation, the company's output of the catalyst has been substantially increased. The company operates similar facilities in Fort Worth for the production of these vital products.

Cyanamid's newly constructed plant is a 22,000-sq. ft. structure occupying part of Cyanamid's 90-acre site near Michigan City.

Garber is Named General Manager of Hinderliter

L. L. GARBER

L. L. Garber, vice president, H. K. Porter Co., Inc., has been appointed general manager of the company's Hinderliter Tool Co. division, Tulsa, as recently announced by T. M. Evans, president.

Before joining Porter Co. Garber was successively production manager, Pittsburgh Screw & Bolt Corp.; assistant plant manager, Curtiss Propeller Division, Curtiss-Wright Corp., and vice president, Tracy Manufacturing Co., where his duties covered production management and industrial relations.

Garber has been succeeded as general manager of American-Fort Pitt Spring Division, by H. A. Harrington, former works manager. Harrington was formerly vice president of Good Roads Machinery Co., New York.

Franks Appoints Corry As Sales Manager

S. E. CORRY

The appointment of Stuart E. Corry as sales manager of Franks Manufacturing Corp., Tulsa, replacing A. H. Knight, resigned, has been announced by Carl White, Jr., president.

Corry has served Franks in both engineering and sales capacities since 1943, including positions of assistant chief engineer, chief products engineer, Illinois district sales manager, Texas Gulf Coast district manager, and most recently as Oklahoma district manager of sales and service.

Jenkins Names Dauphinee Sales Representative

Howard J. Dauphinee has been appointed to Jenkins Bros. valve-sales staff, as announced by Charles C. Chamberlain, vice president and general sales manager. Dauphinee will cover the northern California territory for Jenkins, working out of its San Francisco office.

Before joining Jenkins, Dauphinee was head of export sales for Enterprise Engine & Machinery Co.

Mountain Iron Opens New Kansas Store

Mountain Iron & Supply Co.'s new Plainville, Kans., store.

Mountain Iron & Supply Co. has announced the opening of its new Plainville, Kan., store, with Onis Taylor as superintendent. The company now has Kansas stores in McPherson, Chase, Russell, Great Bend, Madison, and Plainville.

Officers of Mountain Iron are: Max Beren, president; S. O. (Bud) Beren, vice president and division manager; Allan A. Staub, secretary; F. L. McClellen, assistant division manager, and R. R. Rishel, secretary for Kansas.

Hill, Christopher Form New Advertising Agency

Herb Hill and Jim Christopher have teamed up to form an agency under the name of Hill & Christopher, Advertising. Offices are located in Los Angeles.

Hill brings the Halliburton Oil Well Cementing Co. account to the agency and will serve as senior account executive and director of advertising design. Christopher, who operated his own agency for the past 2 years, will serve as senior account executive, copy chief, and agency manager.

Lane-Wells Announces New Appointments

R. A. HANCOCK

Ray A. Hancock, previously assistant Pacific Coast division manager of Lane-Wells Co., has been transferred to Oklahoma as assistant Mid-Continent division manager. In his 13 years with Lane-Wells, Hancock has served as Pacific Coast division operating superintendent, division sales manager, and assistant division manager. During 1950 Hancock was sub-

L. J. LOBDELL

C. F. LUDWIG

district superintendent at Odessa, Tex.

C. F. Ludwig has been made assistant manager of Lane-Wells' Pacific Coast division, where he will supervise all personnel and assist in the management of all activities of that division. Ludwig joined Lane-Wells in 1937 as a shooter and has been a superintendent of districts throughout the company. Before going to Canada in 1949 as vice president and manager of Lane-Wells Canadian Co., he was Gulf Coast division sales manager.

Lee J. Lobdell has been appointed vice president and manager of Lane-Wells Canadian Co., replacing C. F. Ludwig. His responsibilities will cover the development and maintenance of all phases of the company's Canadian activities. Lobdell has been affiliated with Lane-Wells for 14 years and has served as superintendent of various districts in the Gulf Coast division.

L. V. Steffey has been transferred to the Lane-Wells division office in Oklahoma City as assistant to the division manager. In this capacity he will assist in the supervision of operations, sales, and general administration of the Mid-Continent division. Steffey has been with Lane-Wells for 13 years serving as a rig man, perforator, and as superintendent of various districts in the Mid-Continent division.

Luther C. Thaxton, formerly of Oklahoma City, will replace Steffey as Illinois district superintendent at Olney.

BJ Adds New Oil Well Pump to Line of Products

Byron Jackson Co. has announced the purchase of the Dempsey Pump Co.'s business in Tulsa. The Dempsey pump incorporates a method of oil-well pumping without the use of sucker rods.

Operations will continue at the Dempsey plant in Tulsa, headed by V. C. (Bud) Horner, transferred from Houston. There will be no other changes in personnel.

Borchardt, Gerbereux Advanced by Worthington

A. H. Borchardt has been elected a vice president of Worthington Pump & Machinery Corp., according to a recent announcement by H. C. Ramsey, president. Borchardt will have over-all responsibility for the sale of the corporation's entire line of pumping equipment, including centrifugal, reciprocating, and vertical turbine pumps.

V. de P. Gerbereux has been appointed manager of the centrifugal pump sales division of Worthington succeeding Borchardt.

After graduating from Columbia University with a mechanical engineering degree, Borchardt joined Worthington's erecting and testing department. He became successively draftsman, field engineer, and sales engineer. In 1921 he was made assistant manager of the centrifugal-pump sales department, becoming its manager in 1929. He then became successively sales manager of the Harrison plant, manager of the commercial engineering department, and in 1934 assistant vice president and manager of centrifugal-pump application and sales division.

In 1924 Gerbereux joined Worthington where he became successively a centrifugal-pump designer, an application engineer, and in 1937 assistant manager of the centrifugal-pump sales division.

Conoflow Corporation Increases Field Service

John C. Koch, vice president of Conoflow Corp., Philadelphia, has announced extension of the company's field service to embrace Houston and Pittsburgh territories. The resultant increased demand for its standard line of manufacture as well as the recent development of several new products, particularly in the petroleum and chemical line, motivated the wider coverage in representation.

Harold G. Jones Co., Pittsburgh, has been appointed manufacturer's representatives serving Pittsburgh, western Pennsylvania, and northwestern West Virginia.

M. N. Aitken Co., Houston, will represent Conoflow in Houston and the surrounding trading area extending from Freeport to Lake Charles, La.

Personnel Changes Named By Southern Geophysical

R. H. DANA

Dr. Sidon Harris, president of Southern Geophysical Co., Fort Worth and Midland, Tex., has announced the following promotions:

R. H. Dana has been promoted from vice president to executive vice president; W. D. Baird has been named vice president, and R. E. Davis assistant vice president.

Dana, who has been with Southern since 1945, replaces A. E. McKay, re-

W. D. BAIRD

R. E. DAVIS

signed. Dana had been with Stanolind Oil & Gas Co. in the geophysical department since 1934.

Baird has been connected with Southern since June 1947 when he joined the company in a supervisory capacity. He had formerly been with Geophysical Service, Inc., since 1933.

Davis has been promoted from supervisor to assistant vice president in charge of the Permian basin office in Midland. He has been with Southern since the company was organized in 1945. Before joining Southern, Davis was with Stanolind for 10 years in the geophysical department.

CLASSIFIED ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS. WIRE LINES. E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

FOR SALE: R. L. Cardwell with GAK Waukesha, 1st class condition, $5,000. One super model Wilson single drum servicing unit, 80 hp. Waukesha, 4,000′ wire, all tubing tools, mounted on GM 4-wheel drive truck. $3500. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

ONE New Haven Lathe. 12 feet six inches between centers. Hand cross feed. Two centers. One face plate. One independent chuck. Tool post. Gear changes. 24-inch swing. Excellent second-hand condition. Bernstein Bros. Pipe & Machinery Co., 175 South Santa Fe, Pueblo, Colorado. Phones 53—539.

BUCYRUS, Fort Worth, Wichita spudders. Franks, Longyear rotaries. Good used Equipment. Also tools, pipe, cable. Everything for well drilling. Fishing tools rented—Pressey & Son, Pueblo, Colo.

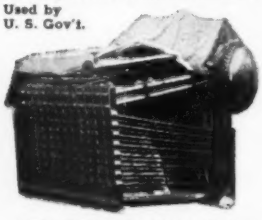
COMPLETE 180-KW Power Plant. 3 Natural gas engines. Prichard Tower, GE Generators, switchboards, auxiliary equipment. Running in good condition. Public Market, 311 S. Klein, Oklahoma City. 3-6356.

FOR SALE
OIL TANKER

Excellent Condition — Surveyed. Built 1945. Diesel driven. 5400 bbls. 174′ x 33′-x 13′. **Marine Div., Nat'l Metal & Steel Corp. Dept. 25, Terminal Is. (Los Angeles Harbor), Calif. Ph: Los Angeles—Nevada 6-2517.**

"Best maintained boilers we have ever seen—perfect." National Insuror.

Used by U. S. Gov't.



3 EA. BOILERS—ASME—3804HS 24,800-33,080# Steam per Hour EACH CROSS DRUM STEEL SEC. HEADER 350 psi.—with integral furnace for economical installation—11.7-12.8 lbs. steam per pound fuel oil

INSPECTION GUARANTEED

Built for 200% rating—Triple riveted 60,000# T.S. Steel Built by Hedges-Walsh-Weidner for Oil or Gas Firing No dismantling—move intact. $8,500 ea.—Loaded Car

UNITED STEEL PROD. CO.
Box 4111 Memphis, Tenn. Ph. 8-6509
—Dealers Protected—

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: One String of Cable Drilling Tools complete with Casing and Derricks. Contact H. H. Blair, 600 Bitting Building, Wichita, Kansas. Telephone 27-3241.

FOR SALE: 3—STEEL SHELLS 10′ x 40′ Riveted, used at Refinery, in excellent condition. Reasonable, located Shreveport. A. A. Gilbert Pipe & Supply Co., Box 986.

FOR SALE: Seamless casing and tubing new and second hand. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

TWO Good Used 45 Star Heavy Duty Spudders. The Star Drilling Machine Company, Chanute, Kansas. Phone 467.

WELL EQUIPMENT: New and used spudders, rotaries, core drills — all sizes and types. Cable tools, drill pipe, bits, pipe, Fishing tools. Everything for Well Service. Pressey & Son, Pueblo, Colorado.

CASING

Have 6,000′ of 9⅝″ 36 lb. J-55 Seamless Casing on order for third quarter delivery. Would like to trade this tonnage for 5½″ or 7″ seamless suitable for 9,600′ well. Phone 3-8601, Shreveport, Louisiana.

EQUIPMENT FOR SALE

FOR SALE: Cardwell L draw works with air operated Twin Disc clutches, transmission, GAK Waukesha. Good condition. CLAYPOOL DRILLING COMPANY, St. Elmo, Illinois.

TWO — 8″, 500 GPM, Waterous Rotary Pumps in good condition. Direct connected to 40 H.P. Explosion Proof 220/440, 3 phase, 60 cycle motors. Waterway Terminals, Inc., Box B, Argo, Illinois.

ONE 6′ x 40′ x ⅜″ steel cylindrical welded oil tank with opening. Excellent condition. Stored at Beeville, Texas. Write Hanson Tank Company, Box 428, Kilgore, Texas.

ONE 36″ x 16′ B.S.&B. Hydrotest Separator ¾″ shell, ⅞″ head complete with 2″ 500# WP oil valve. Like new at 50%. Hanson Tank Company, Box 428, Kilgore, Texas.

Oil Country
TUBULAR GOODS

Completely equipped, well established fabricator has production time available to convert your seamless tubing and pipe by upsetting, threading and hydrostatic testing, to A.P.I. Specifications.

Plant location is on main line railroad within the Pittsburgh switching zone.

Phone or Write
McKeesport 4-9107
Box 405, McKeesport, Pa.

HERE'S THE MATERIAL THAT WILL DO YOUR JOB!

UNUSED SEAMLESS STEEL TUBING: Excellent for Gas or Flow Lines.

50,000′ 2″ O.D. x .125/.160″ Wall 3.01# 14′-26′ Lengths.
20,000′ 2½″ O.D. x .130/.160″ Wall 3.72# 14′-26′ Lengths.
20,000′ 3″ O.D. x .270/.320″ Wall 8.7# 20′-40′ Lengths.
10,000′ 4″ O.D. x .140/.170″ Wall 6.5# 14′-21′ Lengths.

UNUSED STANDARD BLACK LINE PIPE:

50,000′ 1¼″ Standard Black, 2.28#, Plain Ends, 20′ Lengths.
35,000′ 1½″ Standard Black, 2.73#, Plain Ends, 20′ Lengths.
60,000′ 2″ Standard Black, 3.65#, Plain Ends, 20′ Lengths.
50,000′ 4″ Standard Black, 8.64#, Beveled Ends, 40′ Lengths.

RECONDITIONED SEAMLESS TUBING: 1,000# P.S.I. Test.

100,000′ 2¼″ O.D. x .140″ Wall, 14′ Lengths and Over.
50,000′ 3½″ O.D. x .145″ Wall, 14′ Lengths and Over.
80,000′ 4″ O.D. x .145″ Wall, 14′ Lengths and Over.

IN ADDITION TO THE ABOVE, CAN FURNISH MANY OTHER SIZES OF LINE PIPE, OIL WELL CASING AND TUBING—

PHONE OR WIRE COLLECT YOUR REQUIREMENTS TODAY.

A. J. STRUBEL, BROKER

SIdney 1791 (Day Phone) HUdson 8152 (Night Phone) 4946 Murdoch, St. Louis, Mo.

PIPE

ALL SIZES; LINE PIPE AND CASING, TANKS, AND OILFIELD SUPPLIES. EDCO PIPE & SUPPLY CO., PHONES 033 OR 1296, DRUMRIGHT, OKLA.

WILSON Super Winch, MZAU Engine, 57 foot double poles, on GMC 6 x 6 truck, $8,500. Wilson Super Winch, MZAU Engine, 65 foot double pole, on International 6 x 6 truck, $10,500. Both rigs complete with hooks, blocks, lines and all tools to handle rods and tubing. Excellent condition, immediate delivery. Norvell-Wilder Supply Co., P. O. Box 2178, Houston, Texas. Phone AT-3471.

1—36-L Bucyrus-Erie Spudder, Natural gas, gasoline. Galvanized sectional house, floor, timbers, and walk. A complete string of tools for 10", 8", 6", and 5" holes, casing tools for same. Everything necessary to drill with. Box 146, Wellington, Ohio. Phone 69K.

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990 PIECES new 1" O.D. x 16 ga. x 16' phosphorized Admiralty, immediate delivery, market price. Process Construction Co., Inc., 20700 So. Figueroa Street, Torrance, California. Phone: Pleasant 2-6366—Pleasant 1-6660.

FOR SALE: One Bucyrus-Erie 36 L Spudder three and one-half years old. Complete top to bottom tools 15½ to 5½. Also complete tailing in tools. All in first-class condition. List on request. J. E. Griggs, 310 East Third St., Mt. Carmel, Illinois. Phone 959.

FOR SALE OR TRADE: 954' of 5½" O.D. 13# L. W. casing—new; 3,000' of 6⅝" O.D.—13# L.W. casing—#1 used; 500' of 8⅝" O.D.—24# L.W. casing—#1 and 2 used. All above is range 1. I want new 2"—4.6# seamless tubing, preferably range 1. Prefer to trade, but will consider cash offer, subject to inspection and loading at yard near Colony, Kansas. Box E-279, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

Good Used 48-L and 36-L Bucyrus-Erie Drills—Complete with Tools

BEACON SUPPLY COMPANY

Box 398 Pampa, Texas Phone 3377

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-38 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

OIL WELL CASING AND TUBING

Package:
(3200' #1 Used H-40 5½" O.D., 14# Seamless 8 R.T., ⅓ R.2; ⅔ R.1)
(3800' #1 Used H-40 2⅞" O.D., 4.70# Seamless external upset 8 R.T., R.2)

3300' #1 Used H-40 5½" O.D., 14# Seamless 8 R.T., R.2

3000' New J-55 5½" O.D., 14# Seamless 8 R.T., R.2

Package:
(2500' #1 Used H-40 7" O.D., 17# Seamless 8 R.T., R.1)
(1000' #1 Used J-55 5½" O.D., 17# Seamless 8 R.T., R.2)

Package:
(1600' J-55 5½" O.D., 14# Republic E.W., 8 R.T., R.2)
(1600' Re-conditioned like new, 5½" O.D., 14# Seamless 8 R.T., R.2 & 3)

16,350' New J-55 2⅞" O.D., 6.40# Seamless 8 R.T., R.2

All attractively priced.

MICHIGAN CARLON PIPE CO.
20050 Livernois Ave., Detroit 21, Michigan
DIamond 1-1400

FOR SALE: U-15 rotary rig in first-class condition. Has 3 NKU Waukesha motors with less than 1 year service. Without mast or drill pipe, $80,000.00. Will consider good 4000 ft. rotary as part payment. Box E-286, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE: 2 rectangular steel condenser boxes or tanks, open tops. Dimensions 11'4" high X 13'4" wide X 25' and 25' long. Bottoms ⅜", sides and ends ¼" steel. 8" I-beam stiffeners. Liquid tight. Capacity approximately 25,000 gallons. Steel A-1 condition. Our price $1750.00 EACH f.o.b. railroad cars here. Harvey Brothers, Parkdale, Colorado.

FOR SALE: Two 48L Bucyrus-Erie, One 36L Bucyrus-Erie w/Cummins diesel, One RL Cardwell w/new 145 horse Waukesha. All in A-1 condition and can be seen working. With or without tools, dog house, light plants. Box 337, Farmington, N. M.

FOR SALE: 35 HP Lufkin Pumping Unit. 74 inch stroke. Complete. Excellent Condition. Arnold Pipe & Supply Company, Box 3003, Shreveport, La.

FOR SALE: Pressure Tank 52" Dia. 40' long. 9/16" Shell. Riveted construction. Excellent condition. Price .06c pound, loaded truck or car. M. KAPLAN & SON, Pipe, Machinery, Supplies, Monroe, Louisiana.

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40 H.P. HOPE Direct Driven Gas Engine Compressor. Year 1928. Now Operating. Specifications on request. Price $650.00. L. C. Young, Sample Bldg., Morehead, Ky.

CASING PULLING CONTRACTORS with Hydraulic Equipment: Experienced operators—Pull any size pipe, anywhere. Also will buy wells for salvage. GENERAL CASING PULLING CO., P.O. Box 4387, Oklahoma City. Phone 6-1335.

FOUR ea. Buda Lovana Diesel Generator sets, 30 KW 3 phase, 60 cycle, 127/220 volts, $2850.00 ea. three 150 HP Waukesha Engines w/ starting engines, Rad, and Clutch complete #1 condition $1050.00 ea., Fork lift Ross 19HT 7500# lift also 15HT 15000# lift with pneumatic tires, Quonset Buildings 20' x 48' x 10' wall complete less ends $675.00. Graham Pipe & Supply Co., 409 Bewley Bg., Ft. Worth, Tex.

SULLIVAN Model 65 portable drill in excellent condition mounted on 42 Ford truck new motor just installed. Two Speed axle, Garwood split takeoff, 4 x 5 FXT Gardner-Denver mud pump, sliding rotary table, 520 feet of new N rod, 15 foot fluted Kelley. 1948 V8 Ford truck with 500 gallon tank, vacuum lift underslung winch, priced at $4800.00 complete ready to go. This equipment at Wichita, Kansas. Carlson Core Drilling Company. Phones 5-9546 and 2-1784.

ALL EQUIPMENT of five operating wells in Michigan including engines, jacks, tanks, line pipe, drive pipe and about 8,000 feet each of 2" upset tubing, sucker rods, and 5" casing.

Box E-313, The Oil and Gas Journal, Tulsa, Oklahoma

26" O. D. WELDELLS

NEW 26" O.D. x ⅝" Wall Grade "B" Long Radius Seamless Steel Welding Ells. Recommended for 750# ASA Natural Gas Working Pressure.

20	16 degree	Bend
33	19 "	"
23	22 "	"
4	25 "	"
4	28 "	"
5	31 "	"
4	34 "	"
20	37 "	"
22	40 "	"
40	45 "	"

Available for immediate shipment at reduced prices.

THE McJUNKIN SUPPLY CO.
Charleston, W. Va.
P.O. Box 513 — Phone 24-143

WILSON Super Winch, 145 GKU Engine, 65 foot double pole, on Chevrolet tandem truck. Wilson Super Winch, 140 GKU Engine, 42 foot hydraulic mast, on L-10 International tandem truck. Both rigs equipped with block, hook, swivel, B.O.P., etc. Ready to work. Also two late model Chevrolet pick-up trucks. Price an application. Write W. C. Fatjo, Inc., P. O. Box 414, Lafayette, La., or call 5-6137.

FOR SALE: Ideal slush pump, Model C-150. Melton Supply Company, Seminole, Oklahoma.

DRILLING Mud. Colo. Bentonite, it swells, it jells. Few equal, none better. Send for sample. Our price saves you money. Pressey & Sons, Pueblo, Colorado.

---

502 FEET 10-inch seamless casing, like new, 40 pound, 8 V threads. $5.00 foot. Near Tulsa. 1208 E. 20th St., Tulsa. Phone 3-9233.

2,000 FT. 12" OD used plain end line pipe, ¼". Gilbert Pipe and Supply Co., P. O. Box 936, Shreveport, La.

LW STEEL LINE PIPE, T&C or PE: 100,000 ft. 8⅝" OD 24#; 75,000 ft. 6⅝" OD 18.97#; 20,000 ft. 6⅝" OD 13#; 30,000 ft. 2⅜" OD 4#. Frank Morris and Company, 424 South Cheyenne St., Tulsa, Oklahoma.

NEW ELECTRIC MOTORS
Popular brands at consumers' cost less 10%. 7½ to 30 HP, 3 phase 60 Cycle, 220-440 Volts. Splash proof, drip proof, and explosion proof. New stock ready for immediate shipment. Box E-315, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Cardwell R Spudder, butane tank, water tank, junk rack, tool house, light plant, 5½" and 7" tools and equipment necessary to drill-in wells. New lines. Excellent condition. Price, $15,500. Frank Elliott, 708 W. Main, Carmi, Illinois.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WANTED to buy used Ductility machine 5CM. Motor Driven. Berry Asphalt Co., Stephens, Arkansas.

---

400 OR 500 FEET of 2⅞" rge. 2 drill pipe with Hughes Flash weld tool joints. Box 384, Skiatook, Okla.

WANTED: 6,000' New 4½" API Full hole drill pipe, Grade D, R.2. Michigan Carlon Pipe Company, 20050 Livernois Ave., Detroit 21, Mich., DIamond 1-1400.

NEED 10 MILES 6" A.P.I. 5-L PIPE

Major oil company is willing to trade 4" pipe for above; also 10,000 bbl. steel riveted tanks.

Box E-303
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

WANTED

New and Used BOLTED TYPE STEEL TANKS
Also WELDED & RIVETED STEEL TANKS in all Sizes
Also New and Used STEEL CASING, TUBING & PIPE
Will Dismantle
Will pay highest prices

Please phone or wire collect

A. GREENSPON PIPE CO., INC.
(In business over 74 yrs.)
3615 Olive St., St. Louis 8, Mo., LUcas 5851

EQUIPMENT WANTED

2-INCH UPSET TUBING new or used 8 round 10 V or 11½ thread, wrap weld or seamless. Wanted any quantity 1200' to 100,000'. Give price and location, and when can be inspected. Berryman & Humphries, P.O. 6037, Tulsa, Oklahoma.

WANTED—Walker-Neer 33 or Bucyrus-Erie 36 without tools. Must be a late model in good shape and reasonable. R. L. Stubble, Chatham, Ontario.

EQUIPMENT WANTED: One—6' x 35' to 40' x ½" to ¾" Wall x 12 to 14 tray fractionator. Describe completely with price and location. Box 978, Levelland, Texas.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

ASSISTANT PETROLEUM ENGINEER for Venezuelan assignment with major oil company. Single status only. Should have engineering degree and one or more years experience. Give full details in reply to P.O. Box 2819, Dallas, Texas.

INVENTORY ENGINEER for Caracas, Venezuela. Family status. Will make physical inventories of completed installations and prepare field sketches. Should have engineering degree and oil company experience. Give full details in reply to P.O. Box 2819, Dallas, Texas.

HELP WANTED

MAGNETOMETER operator, foreign work. Top salary, subsistence, family living allowance, traveling expenses. Excellent conditions and climates. Our personnel has been notified. Apply Box E-263, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Branch Manager—Sales Manager and Salesman by distributor of engines and pumps in Texas. Address Box E-269, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: One instrument mechanic by independent refinery, Southwest Texas. Permanent employment for the right man. Please furnish experience and educational background, also a picture. Box E-294, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced field geologist, Oklahoma and/or Kansas area to work for independent out of Tulsa. Good future. State complete details: schooling, experience, and salary expected. Box E-278, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL Engineer who has had actual supervisory experience in refinery or machine shop, pump, engine and turbine repair. Southwest refinery. Box E-231, The Oil and Gas Journal, Tulsa, Oklahoma.

TECHNICAL OIL WRITER with engineering degree and practical experience in drilling and petroleum engineering problems in Gulf Coast area. Position is in Houston and preferably the applicant should already reside there. Typing ability and writing-report preparation experience essential. Reply Box E-260, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

ASSISTANT ACCOUNTING MANAGER: Opening for Assistant Accounting Manager in independent southwestern oil company. Requires college degree in accounting or equivalent experience including work in methods and procedures. Interviews for selected applicants at company's expense. Replies handled in confidence. Write Employe Relations, Box 1051, Tulsa, Oklahoma.

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

FOREIGN gravity-magnetic supervisor. Must be of standing in field. Top salary, subsistence, family living allowance and travel expense. Best working conditions. Our personnel has been notified. Apply Box E-262, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

EXPERIENCED Laboratory Tester for independent refinery. When applying furnish full details as to education, marital status and experience. Box E-310, The Oil and Gas Journal, Tulsa, Oklahoma.

AGGRESSIVE OIL EXECUTIVE—Substantial independent producing company wants aggressive, high type, responsible executive as Manager West Texas-New Mexico Division. Applicant should be under 35 years of age, 10 years experience land and geological work preferably West Texas-New Mexico area. Applicant must be equipped to find and negotiate for wildcat, undeveloped, and developed properties and leases, appraise submittals, manage present West Texas office. Excellent compensation. When replying give full details, include photograph. Our present employees not considered for this position. Box E-194, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

EXPERIENCED PRODUCTION SUPERINTENDENT

With Independent Company for East Texas Fields.

State age, experience, references and salary expected

Box E-312, The Oil and Gas Journal, Tulsa, Oklahoma

OPPORTUNITIES FOR TECHNICAL REFINERY PERSONNEL

for

LARGE INTERNATIONAL OIL CO.

Entertaining applications of graduate chemical, mechanical, structural and electrical engineers for refinery engineering assignments at home and abroad.

Engineers with refinery experience and also recent graduates will be considered.

Box E-143, The Oil and Gas Journal, Tulsa, Oklahoma

Opportunity for

OIL GEOLOGIST

Large New York financial institution seeks capable oil geologist (35 to 45) for staff position. Must have had broad reservoir experience in Mid-Continent area, principally in estimation of oil and gas reserves. Excellent references essential. Salary communsurate with position. Address replies to our advertising agency, Albert Frank-Guenther Law, Inc., Dept. 24, 131 Cedar Street, New York 6, N. Y.

WANTED

Aggressive purchasing agent for well established oil well supply company. General office in Oklahoma. Must be experienced in Oil Field Supplies, Drilling and Production equipment. State experience, age and qualifications—all replies held strictly confidential.

Box E-307, The Oil and Gas Journal, Tulsa, Oklahoma

ENGINEER WANTED

An opportunity for a responsible position in an organization with excellent prospects for expansion. For design, development and sales work on a radically new type refinery fired heater. Recent graduates considered. Refinery or heater experience helpful. Reply by letter giving experience, education and salary desired.

SELAS CORPORATION OF AMERICA

"D" St. & Erie Ave., Phila. 4, Pa.

WANTED

Engineers and Physicists with educational background in mechanical, electrical, or electronic engineering, physics or engineering physics for research and advanced development in plant and laboratory instrumentation, geophysics, physical measurements and industrial electronics. Prefer men with five to fifteen years' experience in experimental research, design and development of instruments, intricate mechanisms, electronic apparatus, optical equipment, servomechanisms and allied fields. Positions are of immediate and permanent importance to our operations. Southwestern location in medium-sized community; excellent employee benefits. Please give age, experience, and other qualifications in reply.

Personnel Director
Research and Development Dept.

PHILLIPS PETROLEUM CO.
Bartlesville, Oklahoma

HELP WANTED

SEISMIC INTERPRETER: Permanent location in Edmonton, Alberta, Canada, interpreting records of two seismograph parties for major seismograph contracting organization. Starting salary based on experience; advancement opportunity; permanent position; employes know of this ad. Those qualified by having three or more years' experience interpreting seismograph records may apply by writing Box E-249, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: One pump and engine mechanic by independent refinery, Southwest Texas. Permanent job for the right man. Please furnish experience and educational background, also a picture. Box E-293, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING ENGINEER for South American assignment with major oil company. Must have engineering degree with two or more years experience. Family status after six months. Give full details in reply to P.O. Box 2819, Dallas, Texas.

EXECUTIVE: Substantial company desires aggressive, high type, responsible executive to organize and supervise district exploration office in South Louisiana. Applicant should, preferably, be not over 40 years of age and must have had experience in analyzing and negotiating for development deals, acquisition of producing properties, proven or semi-proven acreage and analyzing geological reports; must have at least a general knowledge of drilling and gas production practice. Applicant must be able to find and initiate negotiations for proven or semi-proven properties, producing gas properties and wildcat prospects if rated as A-1; must also be able to appraise submissions. Applicant must be familiar with South Louisiana area. Primarily interested in proven or semi-proven gas properties and prospects; not interested particularly at this time, in carrying on extensive wildcat exploration activities. Excellent compensation. In replying give full details as to past experience, accomplishments and references, as well as name of present employer and position held, together with photograph. All inquiries will be kept confidential. Will not contact applicant's employer or references without first obtaining permission from applicant. Personal interview with top company officials will be arranged, at company expense, for applicant meeting above qualifications. Box E-296, The Oil and Gas Journal, Tulsa, Oklahoma.

SALESMAN WANTED

Manufacturer of production specialty tools wishes to contact one or more commission salesmen to handle line in Oklahoma, Kansas, and North Texas.

DROVIL COMPANY
P. O. Box 183, Vernon Branch,
Los Angeles 58, California

SENIOR ESTIMATOR

OIL REFINERY OR CHEMICAL PLANT EXPERIENCE

Man with responsible experience in oil refinery or chemical plant estimating. Detailers or take-off men need not apply. New York City location. Major petroleum refinery engineering company. Unusual opportunity for right man. Require experience resume in detail and past earnings record. Our employees know of this ad.

Box E-308, The Oil and Gas Journal, Tulsa, Oklahoma

PHYSICAL CHEMIST

B.S. or higher; well-grounded in Physics; for position with major eastern oil company for experimental work in petrophysics and the study of the properties of porous media and the investigation of certain geochemical problems. Knowledge of core analysis techniques essential. Give details of training, salary requirements, and personal data in letter to

Box E-310, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Lease man, experienced in acquiring oil and gas leases in Mid-Continent Oil Fields, including Texas. Attractive proposition for ambitious young man. Address reply to P.O. Box 752, Pittsburgh 30, Pa.

SERVICE MAN FOR OIL FIELD EQUIPMENT. Must have experience in Production Equipment. Top Pay, Employee Benefit. Box E-284, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Technician with petroleum refining background and thorough knowledge of fluid catalytic cracking operations for technical sales position. Box E-282, The Oil and Gas Journal, Tulsa, Oklahoma.

KEY Seismograph Personnel Needed by Established and Expanding Seismograph Company. Box E-264, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

CHIEF ACCOUNTANT: Present Position proving to be a dry hole. Would you like to hit producer. What have you in proven field? Box E-292, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER—ten years experience in the oil and gas industry desires responsible position. Will consider foreign assignment. Box E-277, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Production and Drilling Supt. on both Rotary and Cable Tools. Deep and Shallow wells, work over and completion, Material, Equipment, routine office duties. 39 years of age. Best reference. Box E-234, The Oil and Gas Journal, Tulsa, Oklahoma.

FORMER Independent Oil Operator ten years, with legal education, plus eight years Wall Street experience, desires connection raise funds exploratory well drilling from excess profits taxpayers. Box D-938, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

PRODUCTION SUPERINTENDENT with over twenty years major company experience in all phases of production and development operations including seven years engineering desires suitable connection with progressive independent producer. Box E-275, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, total of six years experience desires change. Experience includes computing, party chief, and supervision. 36 years of age and single. Permanent assignment in Gulf Coast preferred. Details furnished upon request. Box E-274, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER four one-half years drilling, Development and work over experience. Age 27, Single B. S. Degree. Now Employed, Good reference. Box E-302, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, 31, excellent health, 11 years experience surface, subsurface in Mid-Continent, Rocky Mountains, Gulf Coast, South America. Conversant 3 foreign languages; no military commitment. Prefer foreign assignment. Box E-301, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: B.S., married, draft exempt; 26 years old; one year's experience in subsurface and surface geology in South America. Interested in foreign or domestic. At present employed. Box E-300, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL & GAS ENGR. desires position in pioneer development. Capable of assuming complete operational supervision. Domestic or foreign service. Box E-306, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GRADUATE petroleum engineer, married, veteran, age 25, desires general field work with independent. Employed now and for past 2½ years as reservoir engineer with major oil company. Wish to learn field from bottom up. Prefer 7-day work week. Top references. Box 303, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT oil operator with outside income, 35 years old, married to attorney, would like position foreign country with oil company or government. Speaks French, Spanish, German and Italian. Thirteen years experience in land, seismograph crew supervision, drilling, producing, and developing Texas Gulf Coast. Three years college education. Wants to get away from high tax but would not consider anything less than a two year contract. Write Box E-244, The Oil and Gas Journal, Tulsa, Oklahoma.

TOOL PUSHER 15 years experience on large and medium size rotary rigs. Available at once. Best of references. Box E-305, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERVISOR—Seventeen Years experience refineries, diesel plants, power plants U. S. and foreign. Completely experienced all construction trades. Speak Spanish, some Portuguese. Box E-304, The Oil and Gas Journal, Tulsa, Oklahoma.

CAN you use the services of a man 36 who has been in the business the past 18 years as contractor, producer, land lease, etc.? Interested in steady employment. Best references. George Kissling, 239 Mulberry Ave., Pomeroy, Ohio.

STOP looking for a man to fill that job in production, land, drilling or general field experience. 18 years in the business as independent. Prefer connection with major but will answer and consider all replies. George Kissling, 239 Mulberry Ave., Pomeroy, Ohio.

GEOLOGIST desires association with established, substantial producing company in Rocky Mountain Area, Southern or Southeastern United States. Experienced in managing and directing leasing, exploration and development programs. Genereal working knowledge engineering, reserves, valuation, contracts and submittals. Age 35. Married. Two children. 8½ years association with oil industry. Write Box E-283, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST and Mining Engineer. Specialist with long years of experience for oil and all minerals-strata, desires expert work for limited time. Box 316, The Oil and Gas Journal, Tulsa, Okla.

PETROLEUM Engineer desires foreign or domestic employment; three years' experience; excellent Spanish. Box E-314, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER: M.S. Degree, Ten Years Experience Operations, Construction, Process Design, Instrumentation, Engineering and Purchasing. Age 35. Desire position on New Refinery Projects, Operations or Technical Sales. Presently employed. Box E-311, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

THE Oakland uplift N-E Coles County, Illinois. Has three oil sands above 1,000 ft. Have 1,000 acres of selected leases. Sam J. Burkitt, Moweaqua, Ill.

FOR SALE: Oil and Gas Leases adjoining producing leases, also wildcat leases, drilling propositions and small producing properties; all in shallow territory. W. P. Harley, Bowling Green, Ky.

REAGAN CO. ROYALTY from land owner under well now spudded. Will sell part out of sections 3, 4, & 11, H.E. & W.T. Survey at $80 per acre. Call John Carr, Big Lake, Texas.

IF YOU WANT honest to goodness development and have honest to goodness deal, be it proven or wildcat, write us. Box E-291, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

FOR SALE
PROPERTY IN PARADIS OIL FIELD
St. Charles Parish, Louisiana

Hibernia Bank & Trust Company, in Liquidation, will receive sealed bids for certain of its interests in Paradis Oil Field involving over

9000 ACRES

UNTIL 11 A.M. OF SEPTEMBER 5, 1951

For particulars write:

Hibernia Bank & Trust Company, in Liquidation
Jasper S. Brock, State Bank Commissioner
Thos. B. Kennair, Special Agent
J. Edward McGuire, Liquidator

405 Baronne Bldg., New Orleans, La.

6,500′ 5½″ 15.5 lb. J-55 Long T&C casing available for interest in producing oil or gas well. Box E-299, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

50,000 ACRES, southwest from Jackson, Tennessee. Appraised most promising by State Geologists. Qualified driller willing to take venture after interview and inspection please write Albert Stone, The Sun, Jackson, Tennessee.

LARGE Independent wants properties to repressure. Give full details for quick action. Box E-290, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Will purchase acreage to support wildcats in Kansas, Colorado, and Nebraska and consider drilling deals western Kansas and Julesburg Basin area. Submit details to Box E-296, The Oil and Gas Journal, Tulsa, Oklahoma.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

ACTIVE OIL DEVELOPMENTS

SOUTHWESTERN ROOSEVELT COUNTY, N. M. One well drilling and 2 more ready to drill on powerful structure developed by major company seismograph surveys and subsurface control developed through wells drilled. Indicate major oilfield. Data furnished to lease and royalty buyers.

W. J. PETERMAN, Geologist
Portales, New Mexico

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

FINANCING

YOUR FINANCING PROBLEM can be solved at moderate cost. For details write Box E-241, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION APPRAISAL

PRODUCTION BUYERS
Valuation Geologist experienced in checking properties for bank loans desires to represent company looking for production in Oklahoma. Box 211, The Oil and Gas Journal, Tulsa, Oklahoma.

MONEY RAISING

RECEIVER SALE

To be sold at public action by the sheriff of Washington County, Oklahoma, on the courthouse steps at Bartlesville, Oklahoma, on August 30, 1951, at 10:00 A.M. Leases have good water flood possibilities.

The following leases and equipment to wit:—

160 acre lease in section 35-28-12, Washington County, Oklahoma, with 2 producing wells equipped with #5D Jensen Jacks and AEH Wisconsin gas engines.
2—150 bbl. Steel welded tanks.
1—5 X 15 steel receiver with inside flume.

70 acres in section 36-28-12, Washington County, Oklahoma, with one well making some gas.

80 acres in section 25-28-12, Washington County, Oklahoma, with 3 producing wells equipped with #5D Jensen Jacks and AEH Wisconsin gas engines.
1 abandoned well with 500′ of 10″ pipe in hole.
2—100 bbl. Steel welded tanks.
1—5 X 15 steel receiver with inside flume.

Approximately:
6,500′ of 2″ pipe in yard.
800′ of 8″ pipe.
2,200′ of 7″ OD casing.
2 Jts. of 10″ pipe.
7,000′ of 2″ oil and lead lines on leases.
Small hand tools and other miscellaneous equipment.

For further information call or write,

J. L. WILEY
P.O. Box 468, Telephone 600, Nowata, Oklahoma, Receiver

Pipeline runs from January 1, 1951, to July 1, 1951: 1,405.18 bbls. gross.

ROYALTIES

PRIVATE PARTY will invest to $200,000 cash in producing Royalties, overrides or settled production in small or large deal. Box E-236, The Oil and Gas Journal, Tulsa, Oklahoma.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana.

WE will buy producing or non-producing oil royalties. Standard Security Company, 115 Broadway, New York 6.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

PRODUCING ROYALTIES
WANTED
ANY AREA

BERN SECURITIES CO., INC.
111 Broadway New York 6, N. Y.
WOrth 4-7546

Indiana Fields

(Continued from page 205)

S. D. Jarvis et al 1 Helderman, SW NE SE 21-2n-8w, IP 50 bbl., Aux Vases 1,314-23 ft., TD 1,523 ft.

INDIANA WILDCAT FAILURES

Daviess County: Gopher Drilling Co. 1 Chesser, SW SE NE 19-2n-7w, dry, TD 2,656 ft.
Robert H. Burden 1 Hardin, NE NE SW 4-1n-6w, dry, TD 770 ft.
William Hostettler 1 Evans, E½ NW SW SW 26-5n-5w, dry, TD 1,800 ft.
Gibson County: R. L. Compton-R. E. Fortner 1 Ayers et al, SE SE NW 4-2s-9w, dry, TD 1,786 ft.
Knox County: Skiles Oil Corp. 1 Parker-Church, NW NE SW 4-1n-8w, dry, TD 1,282 ft.
Ivan White 1 Harrell, SE SW SE 19-2n-8w, dry, TD 3,072 ft.
Skiles Oil Corp. 1 Marchino, Military Donation 16-2n-9w, dry, TD 1,710 ft.
Cal Inda Co. 1 Ice, Military Donation 36-3n-8w, dry, TD 1,533 ft.
Posey County:: Slagter Producing Co. 1 Weyerbacher, NE NW NE 26-8s-14w, dry, TD 2,863 ft.
Spencer County: Joe Reznik 1 Weber, SE SW NW 12-6s-7w, dry, TD 1,604 ft.
Vigo County: T & M Corp. 1 Prox, SE SW NW 6-11n-8w, dry, TD 1,856 ft.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: R. E. Hupp 2 Hill-Hardin heirs, 15-Q-25, dry, TD 2,428 ft.
Tuley-Carter and J. Snyder 1 Reynolds-Chase, 12-Q-26, dry, TD 2,050 ft.

EASTERN KENTUCKY

ASHLAND.—In Fleming County 14-V-70 and 2 miles west of town of Sunset, Walter Kline et al are drilling at 950 ft. at 1 Pete MacDonald. Operators are currently drilling the Tyrone lime section and are headed for the St. Peter sand and Knox dolomite sequence. This is the only test in the eastern section of Kentucky known to be actually drilling towards these deeper (Lower Ordovician and Cambrian) formations.

In Floyd County in Big Sandy gas field, Kentucky West Virginia Gas Co. has completed an oil well at its 6001 Lucian F. Burpee. Located at the town of Weeksbury, the well is producing an estimated 10 bbl. of oil daily from the Big lime at total depth of 2,570 ft.

In the same area the same company also completed 5888 B. C. & T. R. May for a well capable of delivering 100,000 cu. ft. of gas daily. Production is coming from the Mississippian-Big lime formation as well as the Devonian black shale section. Total depth is 2,037 ft.

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Southwest Texas

(Continued from page 206)

Dimmit County: Deep Rock Oil Corp. 1 C. W. Barker, NW quarter of I&GN Sur. 44, A-189, dry, TD 8,617 ft.

Duval County: Taylor Refining Co. U-1 Parr, BS&F Sur. 299, A-86, dry, TD 4,806 ft.

Kimble County: Anzac Oil Corp. 1 C. E. Reid, Ezekiel Haines Sur. 61, A-337, dry, TD 1,872 ft.

La Salle County: Howard Hogan 1 Carlos Pena, I&GN Sur. 19, A-897, dry, TD 2,741 ft.

Milam County: W. F. Glenn 1 F. F. Bruggman, J. Benson Sur., 3 mi. E Burlington, dry, TD 1,725 ft.

Travis County: E. R. Marts 1 Annie C. Olson, Sharp Sur., 5 mi. NE Manor, dry, TD 1,300 ft.

Webb County: Robert Hornberger 1 A. M. Bruni est., Block 45, Mariano Arispe Grant, dry, TD 2,450 ft.

Williamson County: Hanson Swenson 1 Swenson, William Byerly Sur., 3 mi. E Coupland, dry, TD 1,590 ft.

Zapata County: Charles Y. Andrus 1 Leonardo Flores, Harry L. Fansler subd. Charco de la Indio Grant, dry, TD 4,000 ft.

Seaboard Oil Co. of Delaware A-1 Robert Hinnant, SK&K Sur. 126, Cert. 110, dry, TD 2,049 ft.

NORTH DAKOTA WILDCAT FAILURES

Cavalier County: Union of California et al 1 Wohletz, C NW SW 32-160n-60w, dry, TD 2,765 ft., not in granite, elev. 1,605 ft., GL.

Pembina County: Turner 1 Gapp, NE SW 7-163n-55w, dry, TD 1,095 ft. in granite, Niobrara 120-265 ft., Benton 265 ft., Jurassic 367 ft., red and maroon shale 424-62 ft., gray shale 462-92 ft., Stonewall 492-611 ft., Stony Mountain 611 ft.

(For other Rocky Mountain wildcat news, please refer to page 197 of this issue.)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 240 acres in T. 35 N., R. 84 W., 6th P.M., Wyoming, within the known geologic structure of the Pine Mountain field, undefined, will be offered for oil and gas leasing, through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p. m., Eastern Standard Time, September 19, 1951, when bids will be opened. Details of the lease offering, how and where to file bids, and a description of the lands may be obtained by addressing an inquiry to the Land and Survey Office, Cheyenne, Wyoming, or to this office. Marion Clawson, Director.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that lots 3, 4, NE¼SW¼ sec. 31, T. 25 S., R. 37 E., N.M.P.M., New Mexico, 119.86 acres, within the known geologic structure of the Monument-Jal field, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p. m., Eastern Standard Time, on Sept. 19, 1951, when bids will be opened. Details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Manager of the Land and Survey Office, at Santa Fe, New Mexico, or to this office. Marion Clawson, Director.

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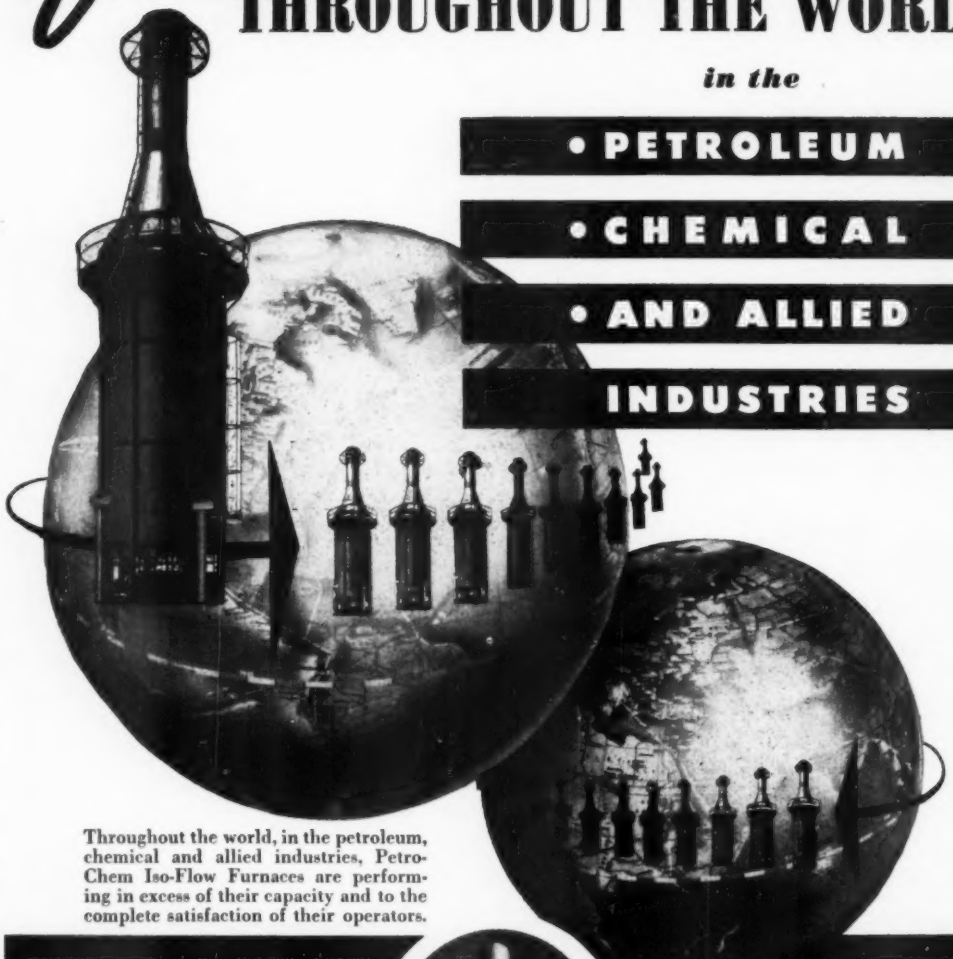
favored

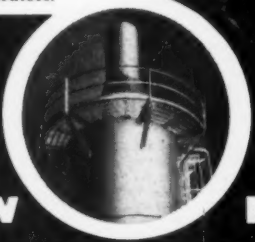
THROUGHOUT THE WORLD

in the

- PETROLEUM
- CHEMICAL
- AND ALLIED
- INDUSTRIES



Throughout the world, in the petroleum, chemical and allied industries, Petro-Chem Iso-Flow Furnaces are performing in excess of their capacity and to the complete satisfaction of their operators.



PETRO CHEM

ISO-FLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INC., 120 EAST 41ST STREET, NEW YORK 17, N.Y.

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Bethlehem Supply, Tulsa and Houston · Flagg, Brackett & Durgin, Boston · D. D. Foster, Pittsburgh
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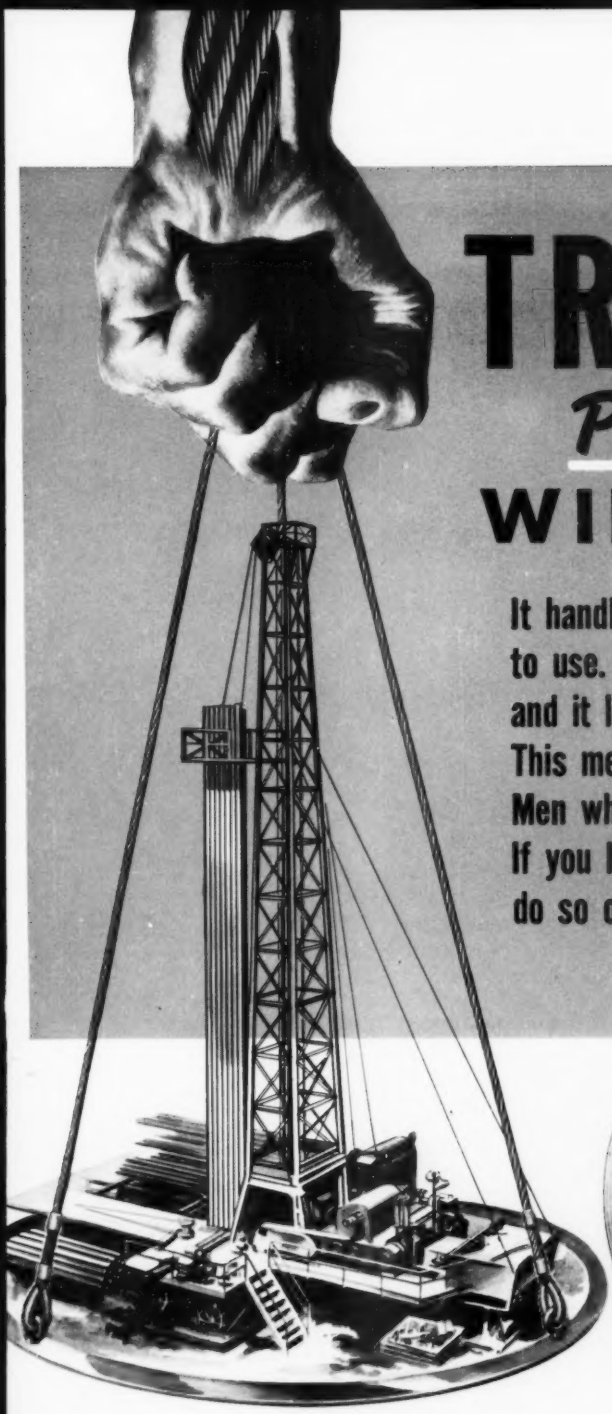

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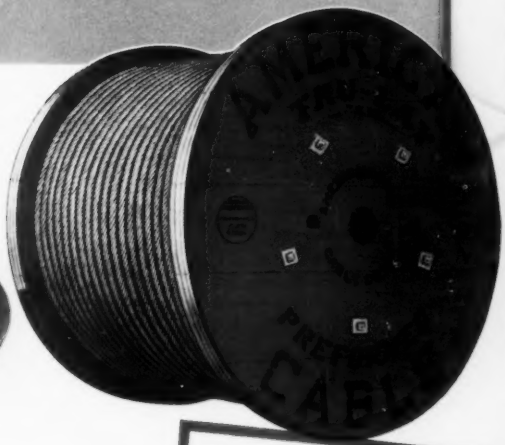

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